PUBLIC WORKS

Feb. 1958

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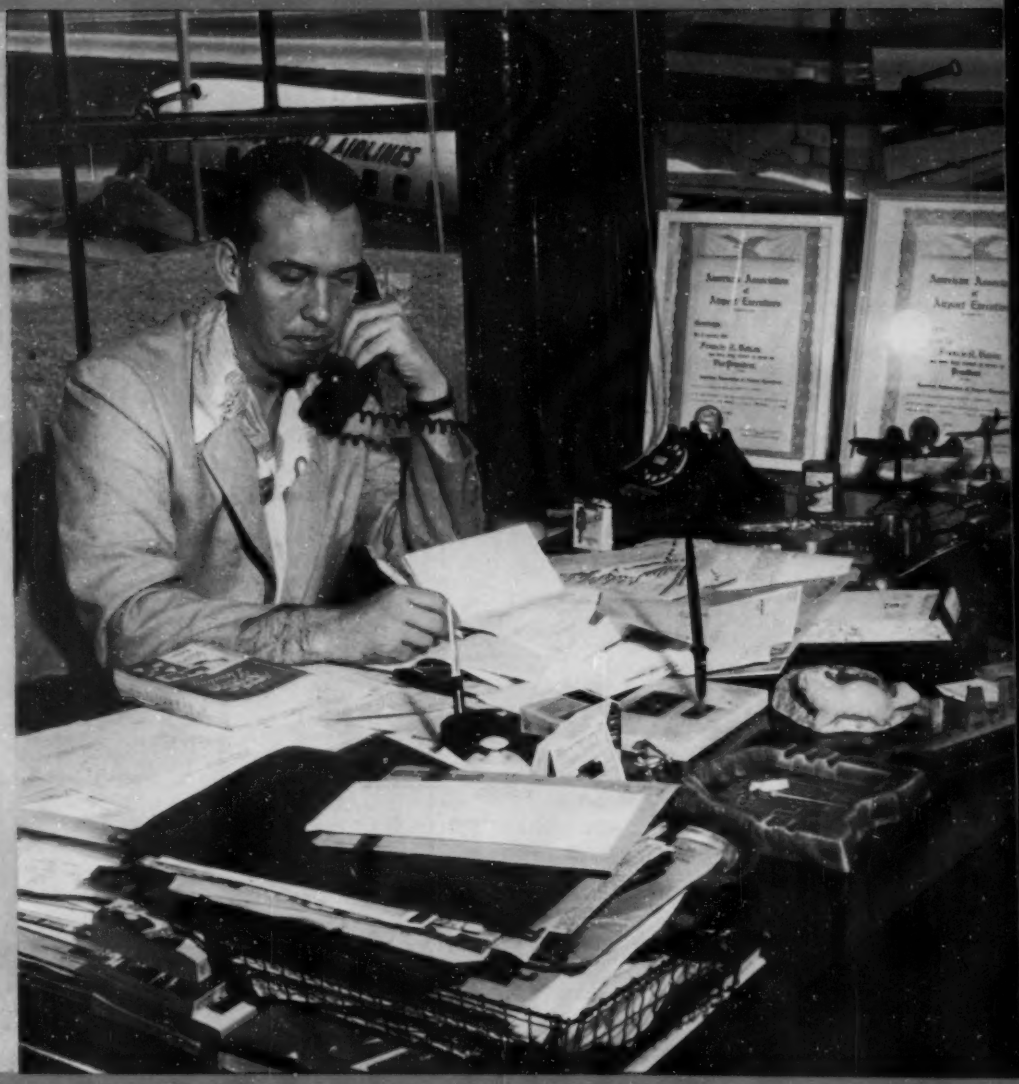
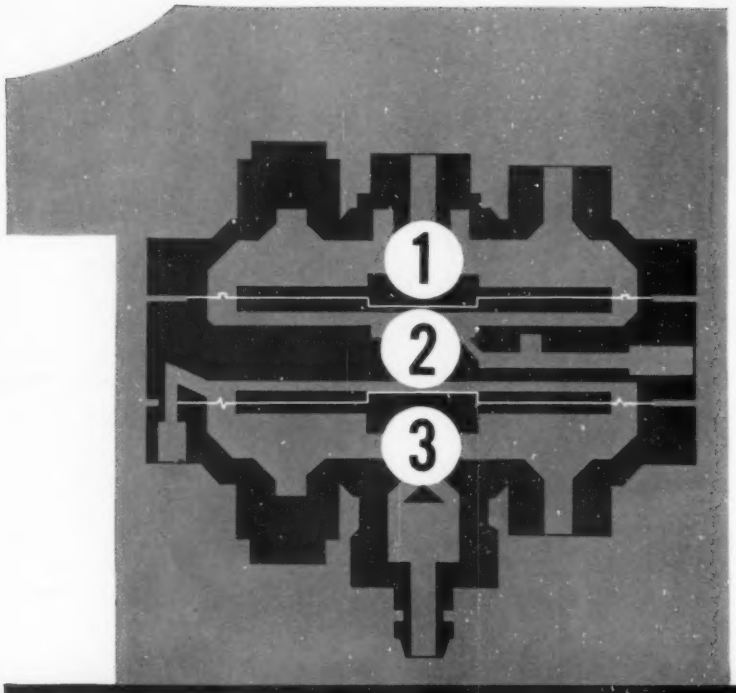


Francis A. Bolton is Superintendent of Port Columbus, the Municipal Airport for Columbus, Ohio. This job presents many of the same sort of problems faced by city and county engineers. More data on page 18.



3-in-1 REGULATOR STACK *

simplifies construction, minimizes maintenance of F & P chlorinator

The simplicity of F & P Model 1050A Chlorinator is truly an outstanding example of modern instrument engineering. Originally designed with individual regulators, the first F & P Chlorinators were vastly superior to any other chlorinators then on the market. Taking advantage of their product lead, F & P engineers continued researching optimum chlorinator design and performance, and came up with a new idea—*stacked regulators!*

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*Patent applied for.

Other features that make this F & P chlorinator an outstanding buy in trouble-free perfo mance and economy include: dependable, positive-acting safety system . . . direct reading flowmeter—you see the rate of flow! . . . built-in capacity flexibility, ranging from 0.1 ppd to 2000 ppd . . . construction materials completely inert to chlorine corrosion . . . accuracy well within ±4% . . . no special skills required to install or operate.

The fiber glass plastic cabinet, available in a variety of colors, is completely resistant to corrosion . . . never requires painting or coating.

Get all the facts on the performance-tested Model 1050A Chlorinator by writing for Catalog 70C140. If you're from Missouri, we'll be happy to send you a list of see-it-for-yourself installations. Write Fischer & Porter Company, 528 Fischer Road, Hatboro, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Toronto, Ontario.

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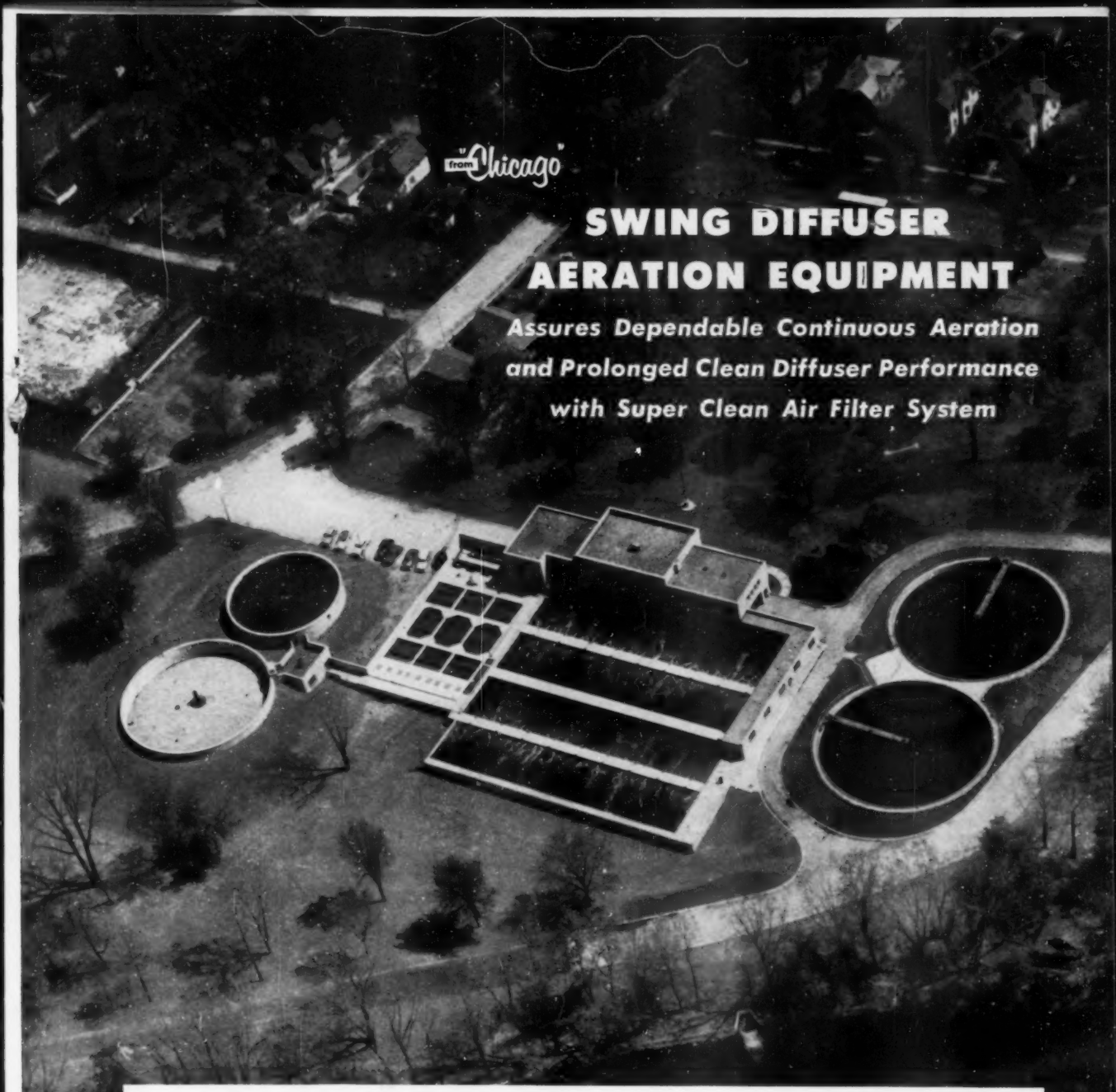

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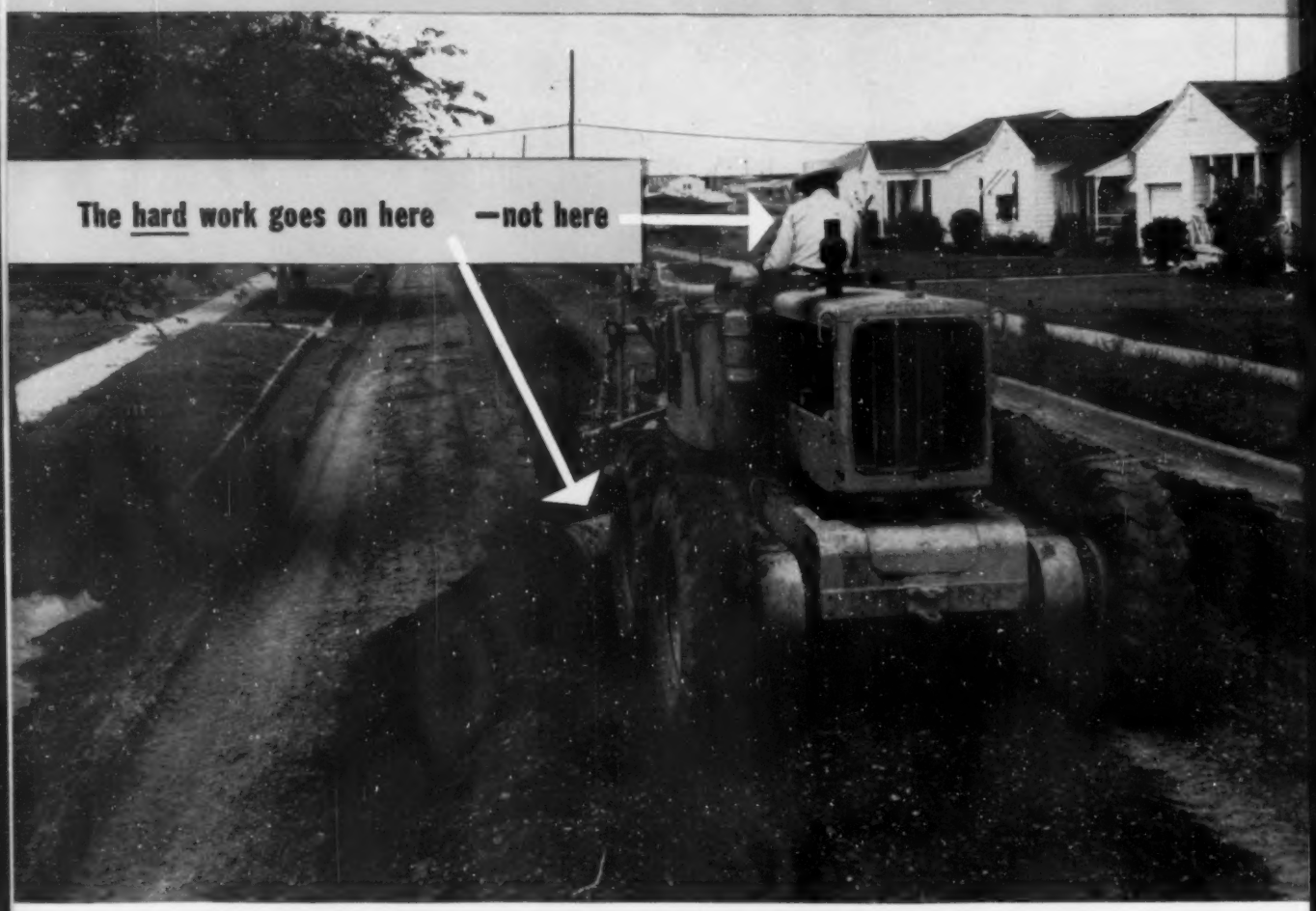

Rebuilding 16th Street between Ft. Worth Street and Dallas Street, Grand Prairie, Texas.

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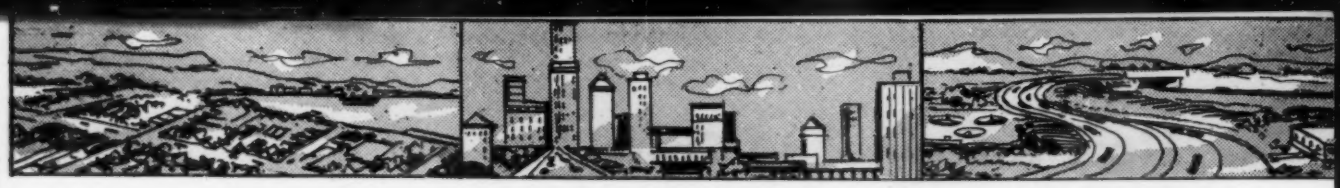

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THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

How a Four-Man Crew laid 1500 feet a day of

CLOW Bell-Tite® pipe

through Florida swampland

CLOW cast iron pipe, with the sensational Bell-Tite joint, proved its advantages conclusively in this Clearwater, Florida, installation.

That a four-man crew was able to lay this CLOW Bell-Tite pipe at 1500 feet a day under these adverse conditions is definite evidence of the time, labor and money-saving advantages of this CLOW-designed joint. Two men worked in the trench—often in 3 feet of water. One man lubricating and aligning the joints, the other assembling with a pinch bar. A crane operator and a hook-up man completed the crew.

CLOW Bell-Tite forms a pressure-tight joint—instantly—no bolts or follower glands required. Under practically all conditions, it is the fastest, easiest and most economical pipe for water main installation. Underwriters' Laboratories Inc. listed in diameters 3- through 24-inch.

Shows simple assembly of CLOW Bell-Tite joint. Just wipe clean, lubricate and push spigot into the bell. When painted yellow stripe is no longer visible, joint is bottle tight.

Under-water assembly of 8" Bell-Tite pipe at Clearwater, Fla.
Contractor: Hancock Pipe Company, Clearwater, Fla.

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CLOW 1878

Subsidiaries:
Eddy Valve Company, Waterford, New York
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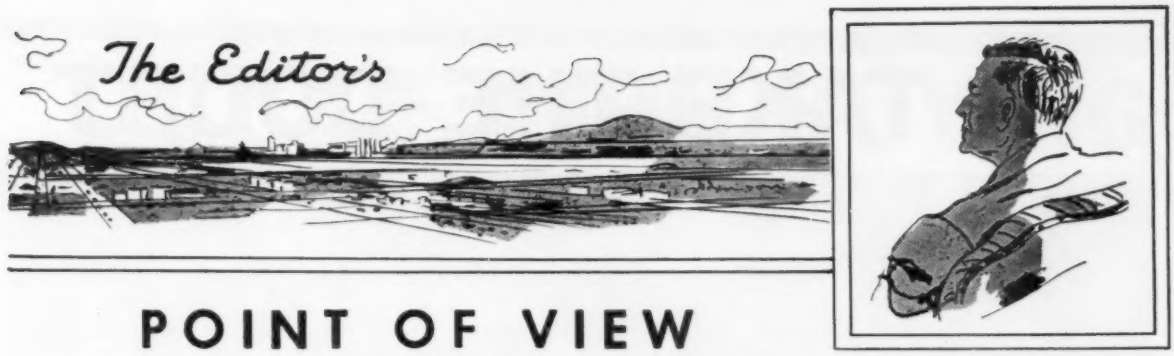


POINT OF VIEW

The Public Works Construction Outlook for 1958

THE Associated General Contractors of America have predicted an increase in public construction of about 8 percent for 1958. This will bring the annual total to more than $15 billion. It is expected that highway and street construction will be up 15 percent, to $5.6 billion, while water and sewage facilities will amount to $1.3 billion.

All types of construction in 1957 amounted to $65.2 billion, of which $47.2 billion represented new construction and $18 billion maintenance and repair. The forecast for 1958 is a potential $68 billion —$49 billion for new construction and $19 billion for maintenance and repair.

The Broad Scope of Modern Engineering

THE FACT THAT ONE of our modern four-lane high speed highways did not have drinking water facilities for its travelers for a year or more after completion has excited some mild comment. The important fact, though, is that this minor happening points out the broad scope of modern engineering. The highway engineer can no longer be merely a pavement man; he must know and appreciate many other of the elements which go into a modern structure. The restricted access highway needs service stations, and these involve water supply and sewage disposal. Travelers have refuse to dispose of, so refuse collection and disposal is also involved. And this problem is not limited to four-lane roads; it is a pressing and costly problem on all main highways. Broad engineering knowledge is becoming increasingly essential.

Focusing National Attention on Water and Sewage Works Operator Training

THERE IS A continuing desire of those who man our water and sewage plants and systems to acquire a fundamental understanding of their jobs. This is borne out by the demand for reprints of PUBLIC WORKS' how-to-do-it series, "Water and Sewage Chemistry and Chemicals," "Operation of Water Treatment Plants," and the latest, "Operation of Sewage Treatment Plants." But no matter how much text is devoted to the subject, the number who can and will absorb knowledge from reading is small compared with those who will benefit from a training course in which the text is implemented with personal guidance and incentive. Short schools or short courses for water and sewage works personnel have met with success in some states. A few of these are well-organized, almost to the point of self-perpetuation. In most states, however, their success is indifferent. It is difficult to believe the need for such training is so unevenly distributed. In fact the need is probably less in those states which are successful, because there the training is well developed.

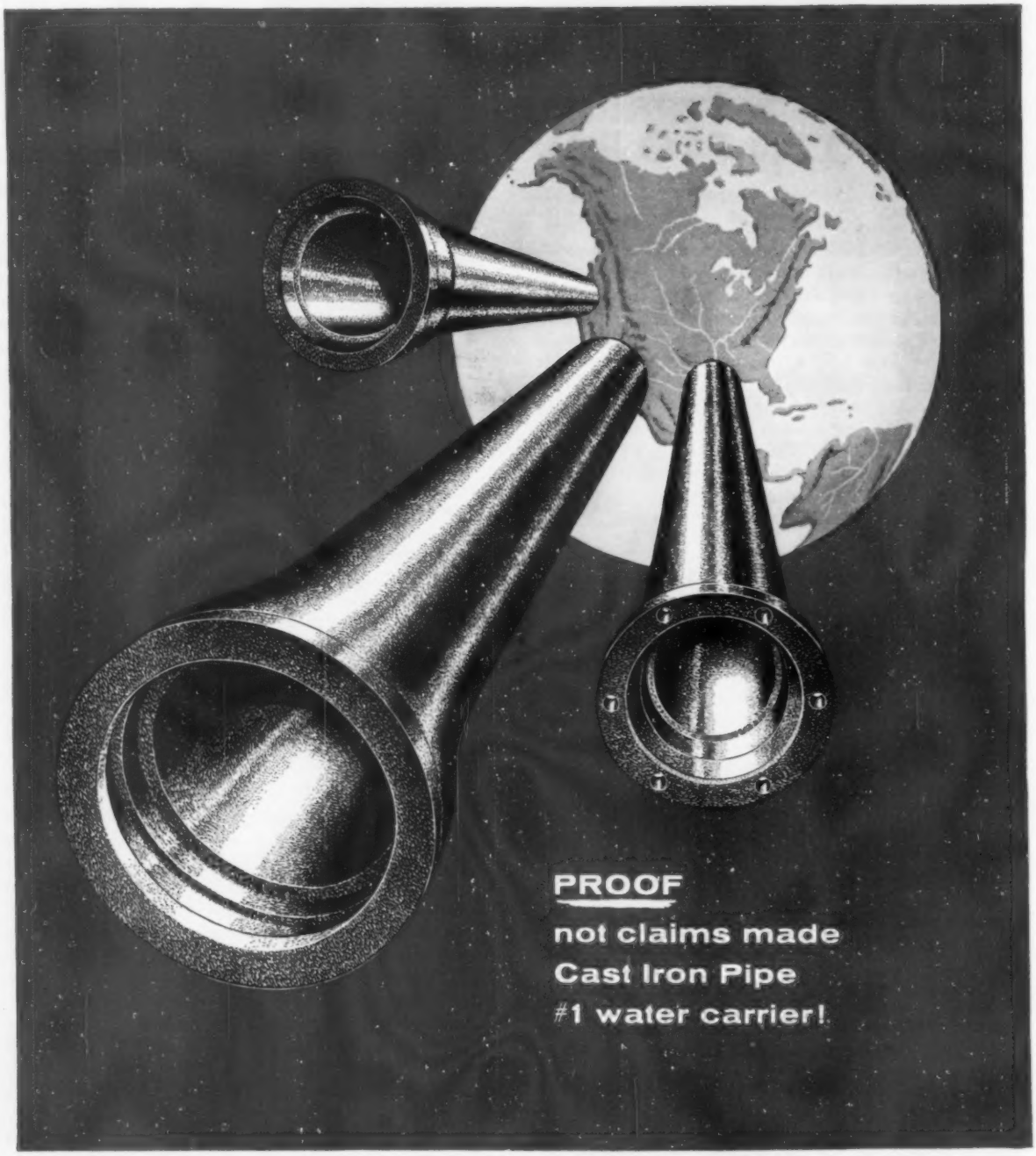
The situation bears analysis at a national level, to find out if the techniques producing success in one area may be applied to others. When those techniques are uncovered, they should be made available in the most useful way. Probably this could best be brought about by employment of an engineer with pedagogical ability at a national level to assist the states in organizing training programs. One of the national organizations is studying training experiences of the states and this effort is commendable. Other groups should participate to assure coverage of the field. Then the whole result should be translated into prompt action.

Many Counties are Faced with City Problems

WE USED TO THINK of counties as being rural areas, with problems totally different than those of cities. That concept is no longer true for many counties; and the trend will continue even if our population increase should slow down—a thing that no one contemplates as probable. Already hundreds of counties have installed water systems, sewerage systems and sewage treatment plants, refuse collection and disposal facilities and even street cleaning. There is no longer any sharp line of demarkation between city and county problems, at least for a large and growing group of our more populous and progressive counties. The problems are much alike and the same types of technical personnel are required to handle them.

As we have said, this trend toward urbanization of county areas outside of the incorporated city limits will continue. It is high time for our state and county administrators to plan for the urban-type services that are now necessary in so many exurban sections. These areas will not improve of themselves but will become progressively worse unless and until a modernized county government assumes the responsibility to serve the people.

TAKE THE DOUBT



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5. **CORROSION RESISTANCE...**
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6. **TIGHT JOINTS...**
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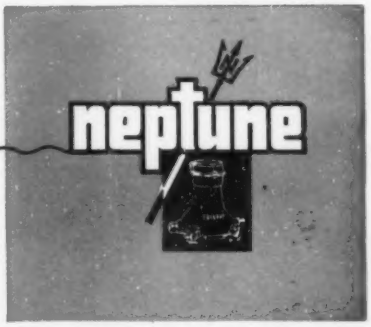

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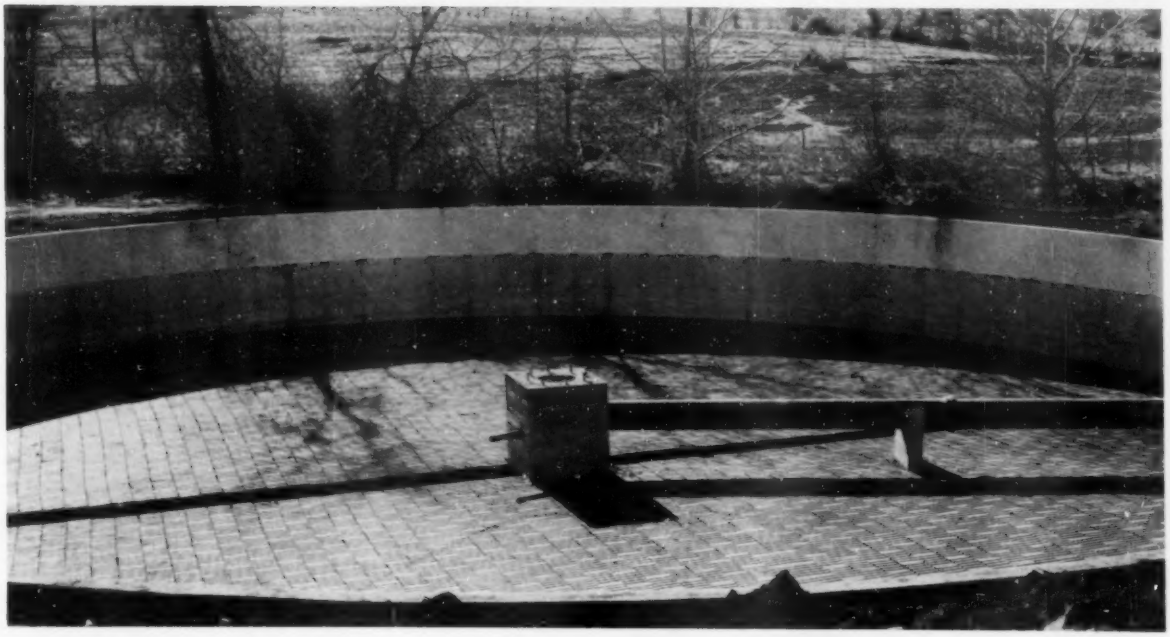

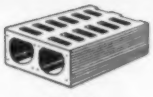

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DICKEY
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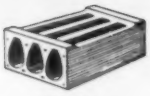

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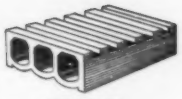
Natco Corporation
Pittsburgh 22, Pa.



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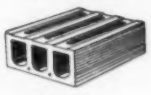

POMONA
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4 WAYS BETTER

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"PERMANIZED" with STORMCOTE Protective Covering Agent

LONG RANGE VISIBILITY — Good target—complete angularity means better visibility and unequaled legibility up to the point of passing.

BETTER LIGHT—BETTER SIGHT — A truly white bead, lead free, of crystal clear quality, without objectionable surface glare. No "dead" spots. Lasting and luminous brilliance night and day.

RUGGED DEPENDABILITY — Unaffected by thermal shock . . . highly resistant to weather, dirt, industrial fumes and other atmospheric conditions.

SAVES TIME AND MONEY — Economical . . . you perform the work right in your own shop.

Now, high quality, low cost reflectorization, never before obtainable at any price, is yours with the new Flex-O-Lite No. 831 Reflective Sign System. Applied economically and "permanized" with STORMCOTE protective coating, you get unexcelled reflectivity and legibility in white and yellow signs that are 'way out front in quality. Put the new No. 831 Reflective Sign System to the test in your own shop. For details write today for new bulletin. Use the handy coupon below.

Available in all standard sizes for Traffic Signs, and "extra-fine" grade for Street Name Signs and License Plates.

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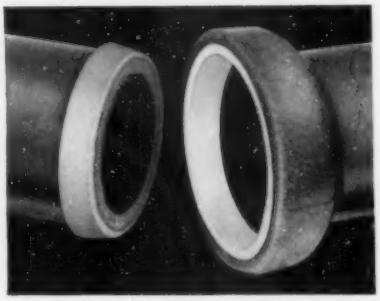
lower installation costs FIVE WAYS with longer, stronger AMVIT Clay Pipe

Outstanding Mechanical Joint of Plasticized Resins of Polyvinyl-Chloride Gives Lower Cost-In-Place



A million dollar expansion program to increase production facilities for Amvit was completed earlier this year. New horizontal extrusion machines now manufacture pipe in over four feet lengths.

Longer lengths lower installation costs, reduce the number of joints, lessen the number of pipe sections to be handled. *Here's how you can save on installation with Amvit:*

1 SAVES LABOR

No other materials such as caulking, joint compounds, hot pots or ladles are needed to make the Amvit Joint. The joint is on the pipe delivered to the job ready for use. Nothing else is needed. Just push the pipe together and the joint is complete.

2 IMMEDIATE BACKFILLING

As soon as the joint is made, backfilling can start. No need to wait for unnecessary delays caused by bad trench conditions, high-water table, unstable ground or running sand. Barricades can be removed and streets opened days sooner.

3 QUICK TESTING

No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

4 PERMITS DEFLECTION, ABSORBS SHOCKS

Amvit is made from a plastic which has many characteristics similar to rubber. It is pliable, permitting deflection without leakage. It is resilient, can absorb shock and vibration. This allows for settlement of pipe in poor ground conditions after backfilling.

5 COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

Amvit line being installed in Amherst, Ohio

SINCE 1900

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American Vitrified Products Company

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MANUFACTURERS OF: Clay Pipe, Flue Liners, Clay Liner Plates and Concrete Pipe.

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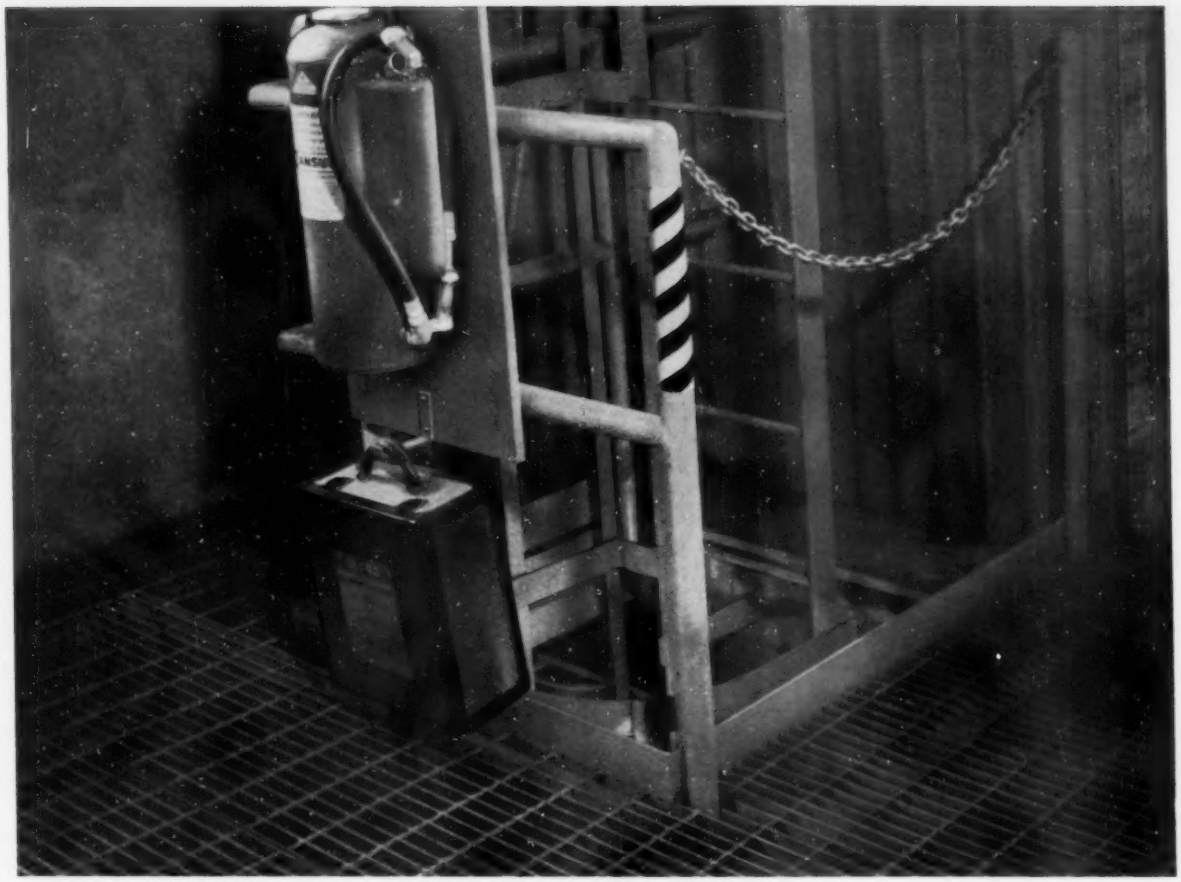

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that's why you see so many symbols of safety

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Each section of Blaw-Knox Steel Grating is of rigid, one-piece construction. Choice of cross bar and bearing bar designs and spacings affords maximum safety under all working conditions. Indoors or out, you get safe, quiet, long lasting and self-cleaning flooring with maximum passage of light and air.

Blaw-Knox Electroforged Steel Grating is fabricated in a wide selection of materials to exact customer specifications. Fits easily and neatly into even the most congested areas.

Send for new Blaw-Knox Grating Catalog 2527. See new ideas in flooring, walkways, stair treads, platforms, shelving. Write today.

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★ Design ★ Construction ★ Maintenance of Expansion, Contraction and Construction Joints in Concrete Structures!

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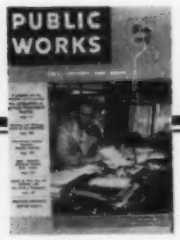

Francis A. Bolton, otherwise known as Jack, is Superintendent of Port Columbus, Municipal Airport Division, Columbus, Ohio, a position he has held since 1945. He attended Ohio State University 1937 to 1941, which he left in his senior year to join the Navy. He was with Patrol Squadron 74, as Operations and Intelligence Officer on anti-submarine patrol duty in the Caribbean and South America; he then was in Africa as Maintenance Officer for patrol squadrons from Sept., 1942, to March, 1944. Following his return from overseas, he was assigned to the Naval Air Station in Columbus. Upon separation from the Service, as Lt., USNR, Aviation, with a Unit Citation, in late 1945, he became Superintendent of Port Columbus airport.

He has been active in Naval Reserve affairs and was attached to a Naval Reserve Squadron until recently when he was retired. He has been active in many state and local organizations and is now Chairman of the Aviation Division of the Ohio State Safety Council. He was president (in 1953-54) of the American Association of Airport Executives; has been a member of the secretary of Commerce's Airport Panel; an Airports member of the FCDA; is a director of the ARBA; a member of numerous aviation associations; and area commander, aviation, of the Ohio Civil Defense Corps.

He and Mrs. Bolton live in Columbus; they have two boys and a girl. Mr. Bolton is, naturally, an Ohio State football fan; is interested and active in Boy Scout work; and, since he has two sons participating in Little League baseball, he maintains close contact with the local teams in the league.

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JAEGER'S 50 CFM MORE AIR SPEEDS RUSH WORK

By producing 365, not 315, cfm of 100 lb. air, this Jaeger Rotary is operating six 80 lb. breakers at full efficiency to finish a rush job in busy Benjamin Franklin Parkway, Philadelphia. Full load speed only 1700 rpm.

FULL AIR PRESSURE AT 5200′ ELEVATION

Installing cable for Denver, Colorado utility, this Jaeger "125" Rotary is holding full pressure in two Thor heavy duty breakers. Full load speed is only 1700 rpm. Jaeger originated the 125 cfm compressor rating.

JAEGER'S 125 AND 250 CFM SIZES ON 2-WHEELS

Jaeger 125 and 250 rotaries give you the advantages of Jaeger's higher efficiency (1700 rpm full load speed instead of 1800-1950), plus full size tool boxes, retractable pneumatic-tired dolly wheel and 8-hour fuel tanks, with 2-wheel mounting. Four-wheel units are available in 365 and 600 cfm sizes.

Your Jaeger distributor will gladly give you full details and demonstration — or let us send you Catalog JCR-5.

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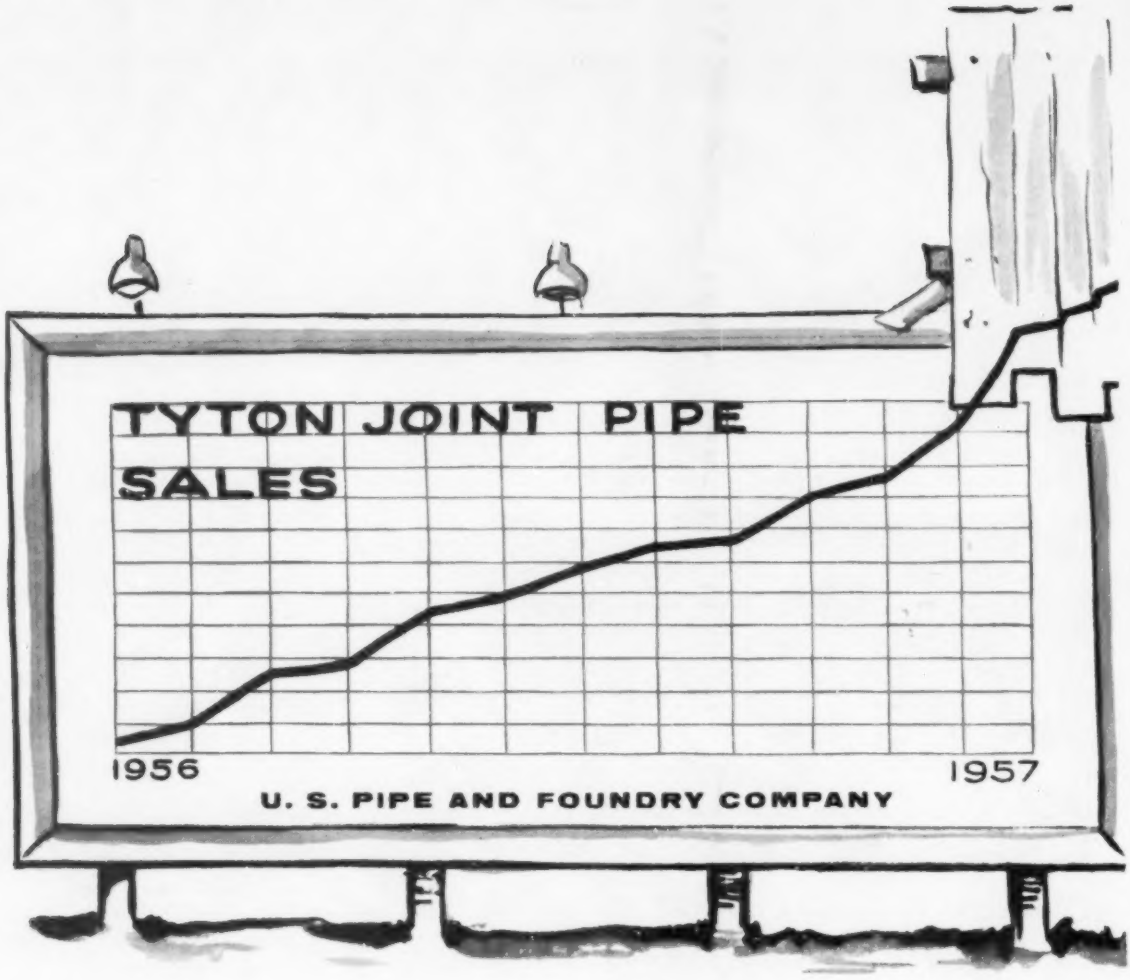

makes friends

Tyton Joint® pipe was introduced a little over a year ago. Since then its acceptance and performance have been phenomenal.

And no wonder. Tyton Joint delivers everything a pipe user needs... and then some. It's easy to assemble—even a green crew gets the hang of it in no time.

Only one accessory needed... a specially designed rubber gasket that seats into the bell. When the entering pipe slides in, the gasket is compressed to give you a

TYTON U.S. cast iron PIPE FOR WATER, SEWERAGE AND

everywhere

permanent, bottle-tight seal. No bell holes. No caulking equipment needed. No nuts or bolts to fasten.
No worry about weather, either. You can lay Tyton Joint pipe in rain or wet trench.
Like to know more about "Tyton," the ingenious pipe joint that cuts costs, saves time, sidesteps trouble? Call or write today.

U. S. PIPE AND FOUNDRY COMPANY
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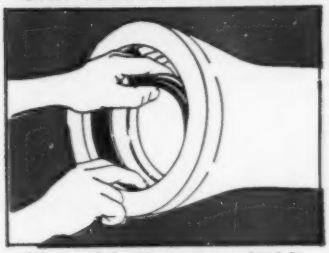
A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE

INDUSTRIAL SERVICE CAST IRON

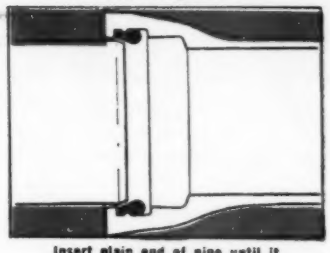
U. S. TYTON JOINT

ONLY FOUR SIMPLE ACTIONS

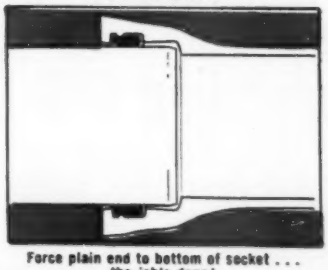


Insert gasket with groove over head in gasket seat

Wipe a film of special lubricant over inside of gasket

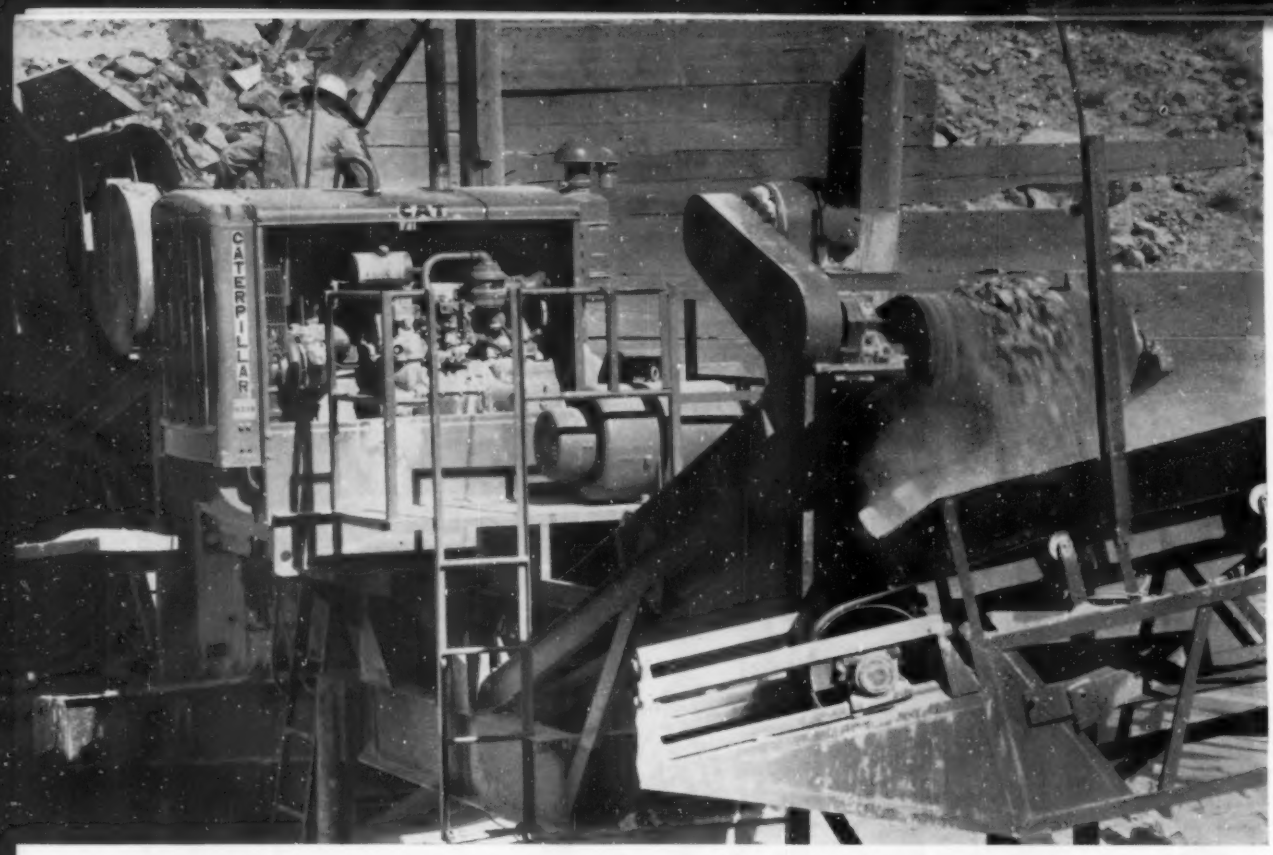


Insert plain end of pipe until it contacts gasket



Force plain end to bottom of socket . . . the job's done!

20" Tyton Joint pipe being installed for water supply line in Alabama.



On the Umatilla County job near Pendleton, Oregon, a dependable Cat D339 Engine drives this Kue Ken crusher, while a D17000 drives a generator furnishing power for operation of six motors. With the aid of Caterpillar power, the county recently completed a 13-mi. job. Operating two 8-hr. shifts, in basalt rock, 1¼-in. minus — gravel costs (in the bunkers) were only 61 cents a yd.

High quality, low final cost and economy of operating CAT Diesel Engines appeal to government purchasers who must look twice at their budget

"Caterpillar equipment is doing a good job. The low operating costs appeal to us. We appreciate a well-stocked Caterpillar Dealer nearby, and the warranty policy means an awful lot, too." So says C. C. Slavens, superintendent of the county rock crushing operation near Pendleton, Oregon. Umatilla County uses three Cat Engines on this job (see photo above).

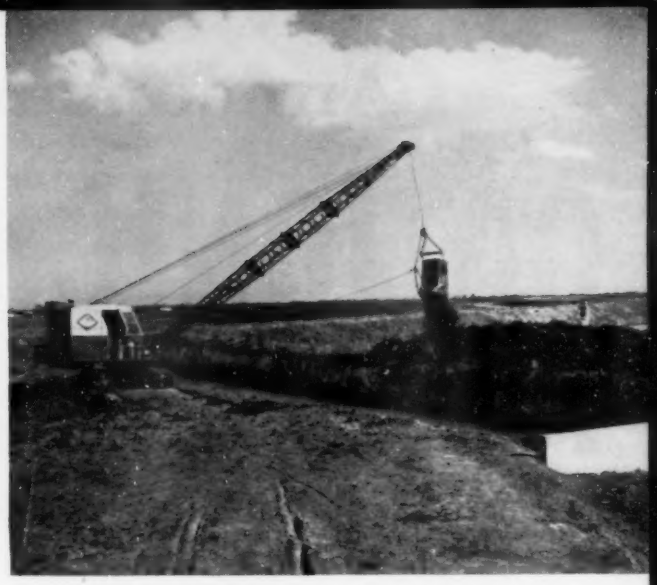
This comment is typical of county, municipal and state officials—who must pare all fat from their budgets over the long haul to justify taxpayer investment. Because of precision workmanship and superior materials, dependable Cat Diesel Engines are acknowledged to have extra-long life and very low maintenance costs. And in rough and dusty applications like rock crushing, features such as the full-flow oil filter multiplies engine life—cleans *all* the oil, not just part of it.

Developed as the first tractor-diesel engine, the same basic characteristics for smooth lugging and the ability to idle for long periods make rugged Cat Engines the best bet to power and repower shovels, rock crushers and other equipment where continuous operation and low operating costs are of vital importance. Your nearby Caterpillar Dealer is a community leader—you can count on his dependable service and the right-now availability of genuine Caterpillar parts to help cut down time to a minimum. Call him today for expert advice.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U. S. A.

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Cat D6 Tractor makes site for crusher setup, operated by Umatilla County Road Dept. Same basic engine that makes Cat Motor Graders and Tractors top performers is available to guarantee dependable performance in crushers, shovels and compressors.



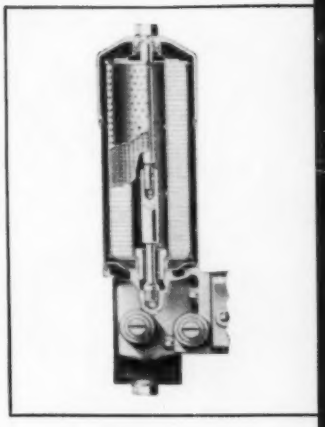
Cameron County Water Improvement District No. 2 (San Benito, Texas) relies on a D318 to power a Lima dragline on a levee improvement job because: "... Four years old and never touched, except to replace screw tops on piston heads on warranty!"

ENGINE POWER BY CATERPILLAR

This Caterpillar D17000 Engine was picked to supply 100 KW to run six electric motors on the crushing job northeast of Pendleton, Oregon. With Cat Engines you get minimum down time, help keep other equipment on the job 60 minutes every hour.

Full-flow Cat Engine oil filter insures that engine oil is constantly being filtered to extend engine life and reduce maintenance costs by cutting down wear and tear on moving parts. The filter element is easily changed in five minutes.

The special plastic-impregnated filtering material (accordion pleated to increase working surface) functions effectively through an entire oil change period. Harmful particles are removed but beneficial oil additives are retained.



Dept. PW2, Engine Division
CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.

Send me more information about Caterpillar Diesel Engines for prime and repowering use in the government and public service field.

☐ Have Cat Dealer call for an appointment, as I may be in the market for a Cat Diesel Engine or Electric Set. I understand that I am under no obligation.

☐ I am interested in learning more in general about these engines.

*Name*_____

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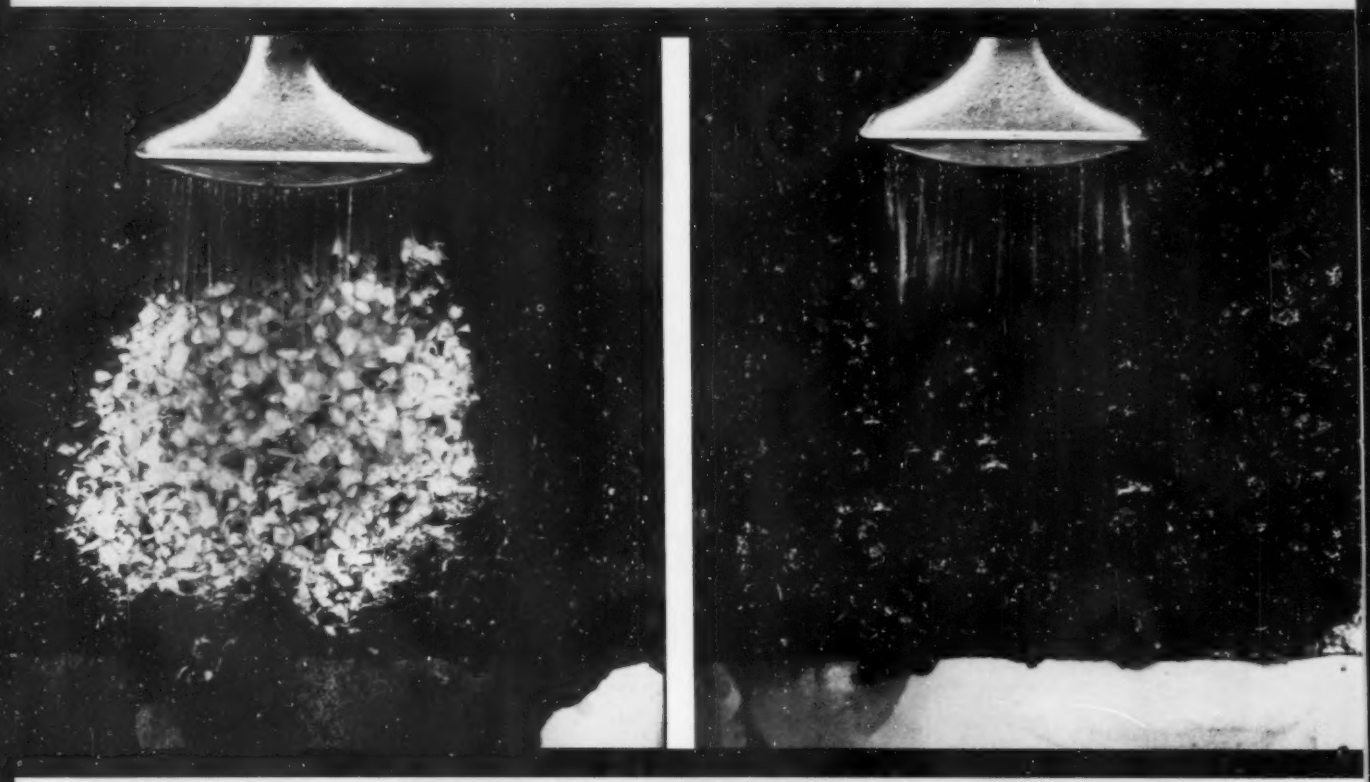
CATIONIC BITUMULS

- **Coats "Treacherous" Aggregate**
- **Protects Your Cold-Mix Pavements and Surface Treatments Against Early Rains**



These unretouched photographs taken in our laboratory clearly show the remarkable ability of CATIONIC Bitumuls to coat and hold silica-crystal chips, and to stand up under early rainfall. Here are two samples of cold-mix materials. They are identical with this exception: the sample on the left was mixed with a conventional road emulsion; the sample on the right was mixed with new CATIONIC Bitumuls. No anti-stripping additive was used. Both samples were allowed to cure for 10 minutes; then subjected, as shown, to equally-metered showers of water. Results: the conventional emulsion almost completely washed off, while the CATIONIC binder still coats the silica chips and holds them firmly in position.

YOU NAME YOUR "HARD TO COAT" AGGREGATE—NEW CATIONIC BITUMULS WILL HANDLE IT!

Now—with new CATIONIC Bitumuls—you can treat "hard to coat" aggregate—damp or dry—fast and effectively.

CATIONICS represents a startling new departure in the making of asphalt emulsions. New CATIONIC Bitumuls because of its versatility and "native" affinity for all aggregates enables you to use damp, slick, "hard to coat" gravels and other hydrophilic aggregates.

This means you can build—

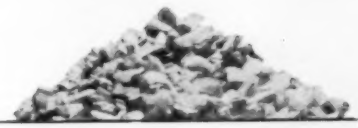
Better travel plant mix pavements
Better surface treatments

And, you get these better pavements at *lower cost* because with CATIONIC Bitumuls you can use many cheaper aggregates that are unsuitable for use with other binders.

Because the product sets quickly, construction damage resulting from sudden rains is reduced to a minimum. In addition, the fresh paving mixture can be quickly rolled and opened to traffic. All of these benefits mean an extension of the working season into marginal weather conditions that normally would prevent emulsion paving work.

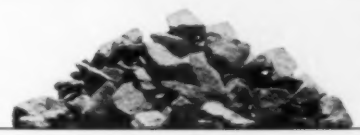
Storage, handling and application are much the same with CATIONIC Bitumuls as with conventional emulsions; however, care must be exercised in the preparation of storage facilities and application equipment. CATIONIC Bitumuls is available from certain of our strategically located plants. Our engineers are ready to discuss projects which you may wish to set up for trials of this new product with specific types of aggregate.

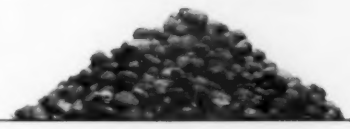
MARYLAND
REFERENCE GRAVEL

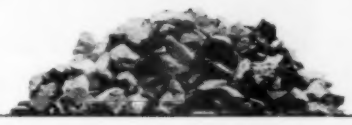

OREGON
CRYSTAL SILICA

PRINCE GEORGE COUNTY,
MARYLAND, GRAVEL

CALIFORNIA
MARBLE CHIPS


PENNSYLVANIA
REFERENCE STONE


OHIO
REFERENCE GRAVEL


MASSACHUSETTS
RHYOLITE

Here are representative samples of the types of aggregate generally regarded as "difficult" by designs engineers. New CATIONIC Bitumuls readily treats all of these. When cold-mixed in a mechanical paver CATIONIC Bitumuls gives thorough stone-coating. There is no stripping in the screw; no drag under the screed. Fast initial set and rapid cure even in deep placements assure early stability; almost immediate rolling.

On Surface Treatment work with slick, hard to coat, (hydrophilic) gravel or stone chips, the new **CATIONIC Bitumuls gives you more in terms of performance** than other binders: rapid set; earlier rolling; faster acceptance of traffic; better cover-stone retention.

Call your nearest American Bitumuls office for information on CATIONIC Bitumuls.

American Bitumuls & Asphalt Company

320 Market, San Francisco 20, Calif. Perth Amboy, N. J.

Baltimore 3, Md. St. Louis 17, Mo. Cincinnati 38, Ohio
Mobile, Ala. San Juan 23, P. R. Tucson, Ariz.
Inglewood, Calif. Oakland 1, Calif. Portland 8, Ore.

MOST ECONOMICAL SWEEPING MILEAGE YOU CAN BUY!

NEW

...MODEL 1000 MOBIL SWEEPER®

The moment you put the new Model 1000 Mobil Sweeper on the job . . you'll find this better engineered machine gives you *more performance* — even on jobs that are "too tough" for other sweepers.

Operating costs will be lower. One operator per sweeper is the only "crew" needed . . . pick-up crews are eliminated. And when the big dirt hopper is fully loaded, Mobil Sweeper takes it to the dump at *maximum highway speeds*. Or, you can operate just as efficiently on a central dumping pattern.

Mobil Sweeper is so much faster — takes only *one-third* the time needed by other sweepers to get *to and from* sweeping areas.

Better maneuverability lets Mobil Sweeper sweep cleaner around parked cars — front end steering permits gutter broom to follow a closer sweeping pattern. Variable-speed brooms can be turned slowly for sweeping up littered gutters . . faster for hard-packed debris. The huge, full-floating pick-up broom sweeps a wide, clean swath.

Deep, wide gutters and sharp curbs, steep hills and heavy beach sand are no problem . . this machine is designed for "tough going." Safety cab protects operator from low-hanging trees — yet gives clear front and back visibility. Big hydraulic power brakes on all four wheels give you truly safe operation when carrying heavy loads of debris.

Hundreds of municipalities and private sweeping contractors rely on Mobil Sweeper . for the safest, most economical sweeping mileage you can buy!

Write for FREE Mobil Sweeper brochure No. PW-2 today!

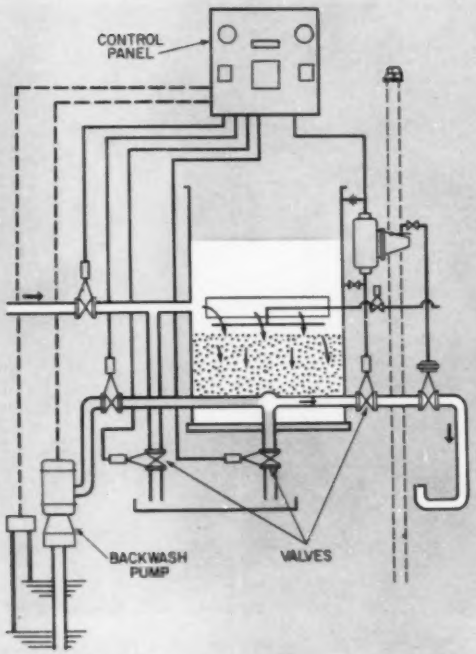
CONVEYCO

MOBIL SWEEPER®

DIVISION OF THE CONVEYOR CO., 3260 E. Slauson Ave., Los Angeles 58, Calif.

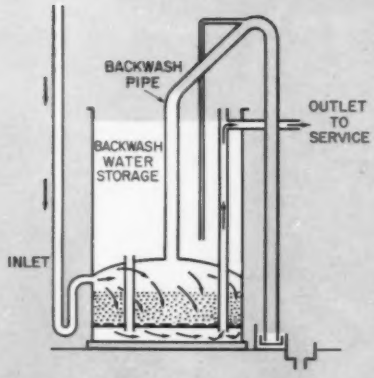
CONVENTIONAL gravity filter and hydraulic controls for automatic operation. Approximate installed cost of a unit that will filter 500,000 gallons per day:

$21,700.00



NEW PERMUTIT VALVELESS Gravity Filter. Completely automatic operation. Approximate installed cost of a 500,000 gpd unit:

$11,900.00



HOW IT WORKS: As dirt collects on the sand, increased head pressure slowly raises the water level in the large backwash pipe. See diagram. When it spills into the downward section of the pipe, it starts a siphon (backwash) flow that draws water down from the Storage area and up through the sand, "floating" dirt off to waste. When backwash water is gone, air enters the small tube and stops the siphon. Flow through the sand reverses and the first filtered water (rinse water) goes to Storage area until full. All flow then runs to Service.

New Valveless Water Filter Saves $$ for Industries, Cities, Electric Companies

• Big water users like city water departments, steam stations, refineries, chemical plants and paper mills can substantially reduce the cost of their water-conditioning equipment and its operation and maintenance . . . by adopting a new automatic Valveless Filter developed by engineers of the Permutit Company (N. Y.).

The simplified design makes ingenious use of the siphon and other hydraulic principles to replace expensive valves, flow controllers, pumps and hydraulic or pneumatic control systems. The design also prevents wasteful, excessive use of water for backwashing or rinsing. Tanks are shipped set-up to reduce installation costs. The absence of moving parts virtually eliminates maintenance costs.

The Valveless Filter produces uniform, high-quality water. It cannot be "forced." Backwashing or rinsing cannot be too little or too late . . . or accidentally run to Service. And the filter cannot develop common troubles like "cracked" or "upset" beds, "channeling" or "mudballs."

Single Valveless Filters or multiple units for any volume requirement are available. Present installations include units for industrial plants treating water for both process and drinking.

Send for free descriptive bulletin. Address: The Permutit Company, Dept. PW-2, 330 West 42nd St., New York 36, N. Y. or The Permutit Company of Canada, Ltd., Toronto 1, Ontario.

PERMUTIT®

rhymes with "compute it"

A Division of PFAUDLER PERMUTIT INC.

Water Conditioning

Ion Exchange • Industrial Waste Treatment

Tip to city officials seeking top refuse-disposal efficiency:

why more sanitary landfill choose 4-in-1 four-machine

The 4-In-1, in Bullclam position, covers compacted refuse uniformly —the way that saves dirt and time, and wins health authority approval!

Here's the Carroll and Peterson TD-9 4-In-1 spreading refuse on one of their sanitary landfill terraces.

"Saves dirt...suits health officials!"

The firm of Carroll and Peterson, Spokane, Washington, uses an International Drott TD-9 4-In-1 to operate a sanitary landfill—in eastern Spokane county. Their terrace-type landfill is in a 45-foot deep ravine. The disposal benches are compacted, then covered daily with six inches of soil.

Partner Bill Peterson reports:

"Here's the right machine for maintaining a sanitary landfill. It saves dirt compared to a regular dozer, yet the health authorities say we are doing a better job of refuse disposal. We can also use the loader to load out sand trucks, and the clamshell action to lift heavy objects. I'd hate to do sanitary landfill work using any other machine than the 4-In-1!"

contractors utility!

Just as handy "anywhere else in town"! You can use the 4-In-1 just as easily to load surfacing materials economically—use it on street work, drives, parks, cemeteries. Use the 4-In-1 machine actions to excavate, strip, grade, spread, bulldoze, landscape, clear land—do dozens of municipal jobs, plus refuse disposal.

Prove the unmatched capacity, economy, and all-around efficiency of 4-In-1 sanitary landfill refuse disposal for your community. See what it means to get 4-machine utility for all city uses, for one moderate investment! Or, find out why the International Drott Bullclam is first choice of larger cities, for full-time, large-capacity refuse disposal. See your International Drott Distributor for a demonstration!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT®

Here's the TD-14 4-In-1, owned by Joliet Garbage Service, spreading cover on compacted refuse with bulldozer action. They use all four actions, every day!

"Twice as fast"

"I spread, roll, and bury refuse twice as fast as before... with the TD-14 4-In-1," states C. A. Moore, equipment operator for Joliet Garbage Service.

This contractor collects and disposes of garbage and rubbish from municipalities (including Joliet)—within a 20-mile radius of the landfill site near Rockdale, Illinois. Upwards of 800 cu yd of refuse is disposed of daily with the TD-14 4-In-1 which also builds landfill roads, loads trucks, does many other jobs!

"I never would believe that one machine could handle our sanitary landfill," adds Mr. Moore. "But every part of the job is easier now with the 4-In-1. Road work is child's play. The clamshell is most useful."

Send for New Sanitary Landfill Booklet

International Harvester Company,
P. O. Box 7333, Dept. PW-2
Chicago, Illinois

Gentlemen: Please send me a copy of your new Sanitary Landfill booklet (Form CR-634-H).

Name_____

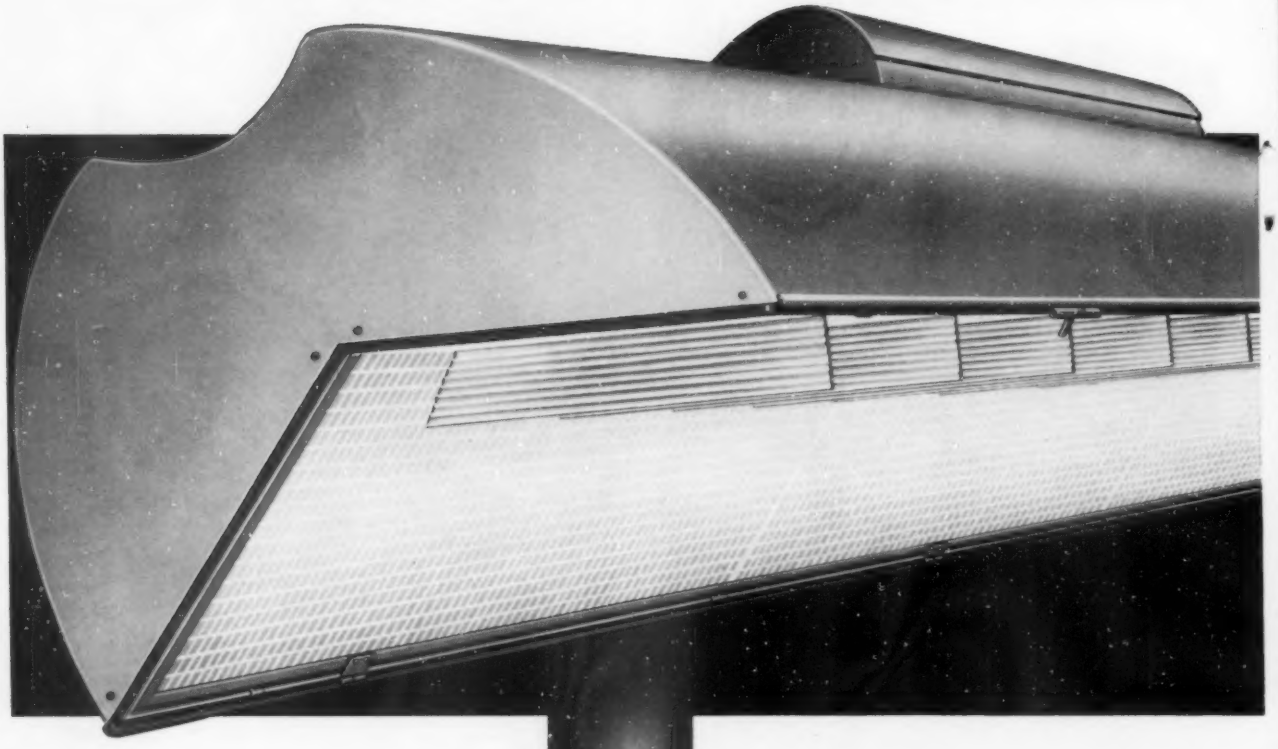
Street_____

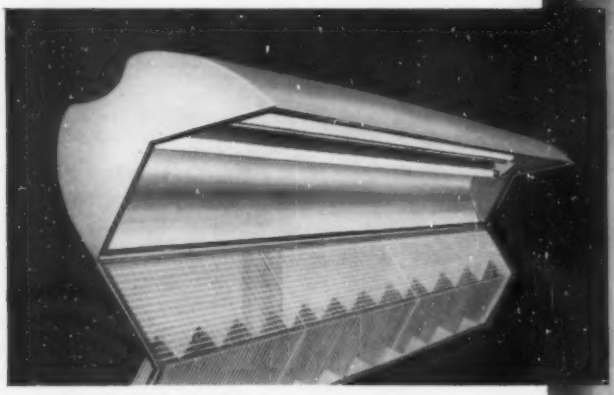
City_____

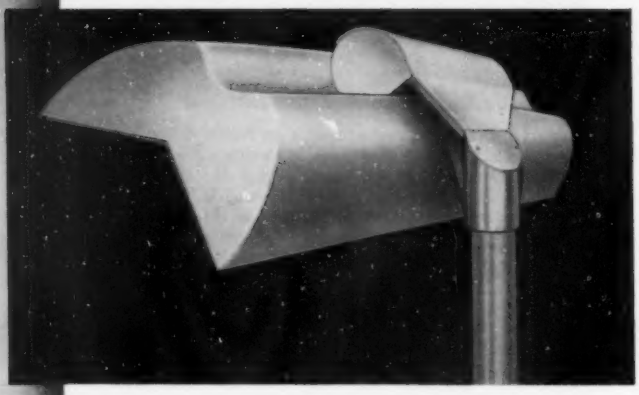
State_____

NEW MAINSTREETER

by Westinghouse







MAINSTREETER INNOVATIONS—GUIDE TO ALL FUTURE STREET-LIGHTING LUMINAIRE DESIGN:

Modern fiber-glass housing *cannot* be dented, is *corrosion-free*, never needs painting. Variety of heat-treated cast-aluminum brackets gives wide choice of mounting arrangements. Newly engineered reflectors of aluminized plastic have *exceptional* specularity! Exclusive acrylic refractor *controls* light *two* ways: interior lenses direct more than 50% greater light output onto the roadway; prismatic louvers direct light *again—further* shielding light from drivers' eyes! Sponge vinyl gasket eliminates moisture, bugs and dust; maintenance is negligible. Stainless-steel hardware retains "new" appearance. Remarkably improved ballast is easily accessible underneath "matching" cover in the support yoke, *eliminating* heat problems! "Universal" lampholders accommodate *all* rapid-start fluorescent lamps, including high-loaded lamps, giving MAINSTREETERS an almost limitless service-life! Simple switch of lamps and ballasts permits *any* circuit operation! J-04435

PARALLEL TO THE STREET! NO GLARE!

WHAT'S MORE—DELIVERS 50% MORE LIGHT TO THE ROADWAY

THAN ANY PREVIOUS FLUORESCENT LUMINAIRE!

Never before—street-lighting like this!

There is now a luminaire that provides faster, more *accurate* seeing—with *greater comfort for drivers!*—than any previous fluorescent street-lighting fixture ever developed! It is the striking new MAINSTREETER luminaire, created by Westinghouse. Moreover, MAINSTREETERS deliver efficiency of performance never achieved with fluorescent street-lighting before!

The sleek MAINSTREETER housing, of "indestructible" fiber-glass, mounts *close* to the pole and *parallel* to the street! So MAINSTREETERS avoid the cluttered daytime appearance of luminaires protruding out over the street. And the housing-ends of MAINSTREETERS—combined with special louvers on the refractor—completely shield drivers' eyes from nighttime glare of the lamps. Vision is unimpaired!

Cast-aluminum brackets provide adequate adjustment for levelling—plus the capability of tilting the luminaire for unusual applications. The entire unit is designed to give *ideal* light-distribution, conforming *exactly* to the street width!—providing *uniform* foot-candle levels—and a definition of objects impossible in the past! With less distraction and better seeing by "everyone," accident rates will be still further reduced!

In addition, new DUAL optical systems PUT OVER 50% MORE LIGHT ON THE STREET!

The *entire* output of MAINSTREETER lamps is now controlled *two* ways! MAINSTREETER refractors have, *inside*, a pattern of countless prismatic lenses—directing *more* light, from contour-engineered reflectors, *specifically* down onto the street! Then, on the *outside*, twelve exclusive prismatic louvers *again* control this light—to achieve a new concept of street-lighting comfort! The result is *better than 50% more complete utilization of all light produced by the lamps!*

See, at left, all *eight additional* features of MAINSTREETER luminaires—*already establishing* all future street-lighting design! Nothing parallels MAINSTREETERS—parallel to the street!

Watch Westinghouse Achievements in Lighting

Orders Accepted Now!

Volume production of MAINSTREETERS already is underway! Traffic engineers "everywhere" proclaim the hope of vastly improved safety records. And this is the expectation of MAINSTREETER illumination! Call your near-by Westinghouse representative for preferred delivery list information TODAY. Or, write to Westinghouse Electric Corporation, LIGHTING DIVISION, Edgewater Park, Cleveland, Ohio, RIGHT AWAY!

YOU CAN BE SURE...IF IT'S

Westinghouse

EQUIPMENT and MATERIALS

FOR YOUR

PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Information on Beam and Cable Guard Rail

494. Complete descriptive literature on guard rail is available from American Steel & Wire Div., United States Steel, Rockefeller Bldg., Cleveland 13, Ohio. Check reply card for specifications and engineering data.

Ultra-Clean Sweeping For Streets, Yards and Airports

499. A new approach to extra-clean sweeping is described in a 4-page illustrated Bulletin (No. 85.55) issued by the G. H. Tennant Co., 755 N. Lilac Drive, Minneapolis 22, Minn. Described is a 7'4" path sweeper that eliminates the use of water for dust control. Check the reply card.

V-Notch Chlorinator For Chlorine Flow Control

502. An 8-page catalog on the W & T Series A-721 chlorinator is available from Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Chlorinator is adaptable to any type of chlorinator control and feed rate may be controlled manually or automatically. Check the reply card.

Grit Collecting And Grit Washing Equipment

580. This 28-page book on grit collecting and grit washing equipment is profusely illustrated and contains data on 7 types of grit collectors, 2 grit washers and the Tritor screen. Detailed drawings and specifications are included to assist the engineer in the preparation of drawings. For your copy of Book 2571 check the reply card or write the Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill., today.

Flocculation Equipment For Water, Sewage and Industrial Wastes

519. A wide choice for flocculation equipment is described in the 12-page well illustrated catalog available from Chain Belt Co., Milwaukee 1, Wisconsin. Check the reply card for specifications and installation data.

Tandem Rollers With Torque Converter

524. Specifications, types, models and features of Huber-Warco tandem rollers are covered in Bulletin HWT-525 available from Huber-Warco Co., Marion, O. Check the reply card for this complete bulletin on rollers.

Copper Sulfate In Control of Microscopic Organisms

529. This valuable 52-page manual on the use of copper sulfate in the control of microscopic organisms in water supplies is available from Phelps Dodge Refining Corp., 300 Park Ave., New York 22, N. Y. Covered are organisms, odors, methods of using copper sulfate, calculation tables and table showing chemicals required for treatment of different Genera.

Rock Salt For Ice and Snow Removal

534. Application rates and procedures of using Morton rock salt for ice and snow control are covered in catalog from Morton Salt Co., 120 South La Salle St., Chicago 3, Ill. Check the reply card for Catalog F35.

Modern Elevated Water Tanks

566. A 16-page bulletin describing 2 types of water storage tanks, the watersphere and the waterspheroid, is available from the Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill. Standard sizes from 25,000 gals. to 500,000 gals. are covered. Check the reply card.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135 describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Manual For the Pest Control Operator

592. This manual contains technical data and complete information about Geigy Diazinon, a long residual organic phosphorous compound for pest and insect control. For full data check the reply card or write Geigy Agricultural Chemicals, Saw Mill River Road, Ardsley, N. Y.

Single Gasket Type Joint For Cast Iron Pipe

602. A double-sealing gasket type joint for cast iron pipe that is easy to assemble and install is described in catalog from American Cast Iron Pipe Co., Birmingham 2, Ala. Tables on pipe from 3" to 48" are included along with recommended deflection tables. Check the reply card.

Water Service Hydrants and Outdoor Drinking Fountains

661. Water service hydrants in 4 sizes, ¾", 1", 1¼" and 2" and all types of outdoor drinking fountains are described in a well-illustrated, 24-page catalog from The Murdock Mfg. & Supply Co., 426-30 Plum St., Cincinnati 2, O.

Manual on Valves, Fire Hydrants and Accessories

670. Complete line of Iowa valves and hydrants are covered in this manual from Iowa Valve Co., Oskaloosa, Iowa. All equipment meets AWWA specifications.

Meter For Measuring Large Water Volumes

613. For metering large water volumes in closed conduits ranging in size from 4" to 72", a propeller type low pressure line meter is described in 28-page catalog from Sparling Meter Co., Inc., El Monte, Calif. Check the reply card for data on accuracy and head loss curves, detailed specifications and latest meter data.

Crane and Excavator Mounts on a Conventional Truck

621. Sherman 4-ton lift capacity crane and excavator is described in catalog from Sherman Products, Inc., 3200 West 14 Mile Rd., Royal Oak, Mich. Dimensions and operating data, crane lifting capacities and boom charts are included. Check the reply card.

Power Unit By Allis-Chalmers

635. An 8-page, 2-color Catalog (S-1247) on the A-C B-125 power unit is available from the Tractor Group, Allis-Chalmers Mfg. Co., Milwaukee, Wisc. Various components of the unit are illustrated and specifications and a list of special equipment are included. Check the reply card.

Application and Design of Prefabricated Pumping Stations

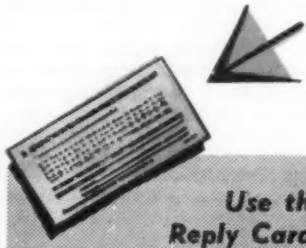
637. This manual is intended for a guide in designing sewage pumping stations and in explaining the use of prefabricated underground sewage pumping stations. Check the reply card or write to Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill., for your copy.

Self-Propelled Shovel Crane

642. A 2-color, 16-page catalog available from The Thew Shovel Co., Lorain, Ohio, shows detailed features of the self-propelled shovel crane that can also be interchanged into a shovel, clamshell, dragline and hoe. Check the reply card for Catalog SP-107 for data on the ⅜ yd., 7-ton unit.

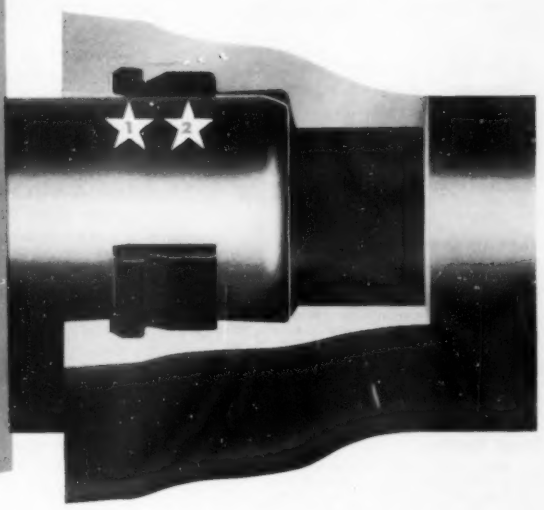
Junior Tandem Portable Crushing and Screening Plants

652. Dimensions and specifications of crushing and screening plants are included in Bulletin JT-4 available from Iowa Mfg. Co., Cedar Rapids, Iowa. Check the reply card for information on jaw and roll crushers, vibrating screen and feeders and hoppers.



Use the Reply Cards For Prompt Service

NEW! AMERICAN Fastite** ® JOINT* CAST IRON PIPE



The superior double-sealing☆☆ single gasket type joint

Exclusive dual-density rubber gasket provides a long-life, leak-free cast iron pipe installation...

1. Hard rubber end provides a strong shoulder for self-centering and self-locking—a permanent seal against cold flow under pressure, fully protected against weathering and deterioration.

2. Softer large end for positive compression, liquid-tight joint sealing and easy assembly.

Tests prove either hard or soft rubber section *alone* provides a positive seal.

The American Fastite Joint* is an all-weather-laying joint. The exclusive gasket—available *only* with Fastite pipe—is self-centering, self-locking, and leak-proof. Increased internal pressures actually increase joint tightness whether pipe is laid in straight alignment or deflected.

Every feature of new American Fastite Joint* Cast Iron Pipe has been scientifically designed, laboratory and field tested, and manufactured to exact specifications with the objective of combining speed and ease of assembly with permanent, leak-free joints. Feature for feature, compare the new American Fastite Joint* with any other pipe joint now available. An American Cast Iron Pipe Company representative will be glad to tell you about the unique advantages to be had only in American Fastite Joint* Cast Iron Pipe.

FREE BOOKLET

Write for your free copy of a new booklet describing American Fastite Joint* Cast Iron Pipe. No obligation.

**Patent applied for—Underwriters' Laboratories, Inc., approved.*

AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

SALES OFFICES

Kansas City • Denver
Minneapolis • Dallas
Pittsburgh • Orlando
New York • Cleveland
Los Angeles • Birmingham
San Francisco • Chicago

To order these helpful booklets check the reply card on page 19.

NEW LISTINGS (Cont.)

Steel Reservoirs and Standpipes For Water Storage

538. Capacities of different sizes of reservoirs and standpipes and specifications are included in Bulletin No. 555 available from Koven Fabricators, Inc., 90 E. Dickerson St., Dover, N. J. Check the reply card.

"Packaged" Electric Power For Mobile Installations

656. A well-illustrated 8-page bulletin describing 3 Onan "packaged" power systems is available from D. W. Onan & Sons Inc., Minneapolis 14, Minn. Illustrated are battery charging with AC power, high battery charging output and battery charging only. Check the reply card.

How to Organize Rodent Control Campaigns

663. A 24-page booklet detailing in cartoon-type illustrations community and rural problems with rats and mice and procedures for organizing individuals and organizations for control work. Write for Rat and Mouse Control Guide and Pest Book from Hopkins Agricultural Chemical Co., 124 South Dickinson St., Madison 1, Wisconsin or check the reply card.

Catalog on Steel Grating

665. New ideas in flooring, walkways, stair treads, platforms and shelving are covered in Catalog 2527 available from Blaw-Knox Co., Dept. W., Pittsburgh 39, Pa. Check the reply card for information on choice of cross bar and bearing bar designs and spacings.

Rubberized Playground Surfacing Material

668. Saf-Pla can be applied to black top, concrete or properly surfaced areas to reduce injuries from children falling. Check the reply card or write to U. S. Rubber Reclaiming Co., Inc., Box 365, Buffalo 5, N. Y.

Reflective Pavement Marking

685. Centerlite reflective compound has the beads already in the mixture and you apply the stripe in one pass on the pavement. Check the reply card or write Minnesota Mining & Mfg. Co., Dept. QV-28, St. Paul 6, Minn., for full details.

Literature on Reflective Glass Beads

690. Glass beads for traffic signs and street name signs are described in literature available from Flex-O-Lite Mfg. Corp., 8305 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo. Beads can be used on white and yellow signs. Check the reply card.

Right-V-Left All-in-One Snow Plow

693. Shifting wind directions are no longer a problem when the Gledhill R-V-L is used in snow plowing. Full details in literature from The Gledhill Road Machinery Co., Galion, Ohio. Check the reply card today.

●

WATER WORKS

Elevated Tanks and Other Storage Facilities

32. Specification sheet covering elevated tank sizes and design and illustrated brochure available from the Darby Corp., Kansas City 15, Kansas.

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For full description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

Equipment For Water, Sewage and Industrial Waste Treatment

24. The complete line of Jeffrey equipment for treatment plants is covered in a 66-page Catalog 905 available from The Jeffrey Mfg. Co., Columbus 16, Ohio. Check the reply card for information on bar and disc type screens, traveling water screens, grinders, grit collectors, garbage grinders, sludge, draw-off valves, chemical feeders, bucket elevators and scum removers to mention some of the equipment.

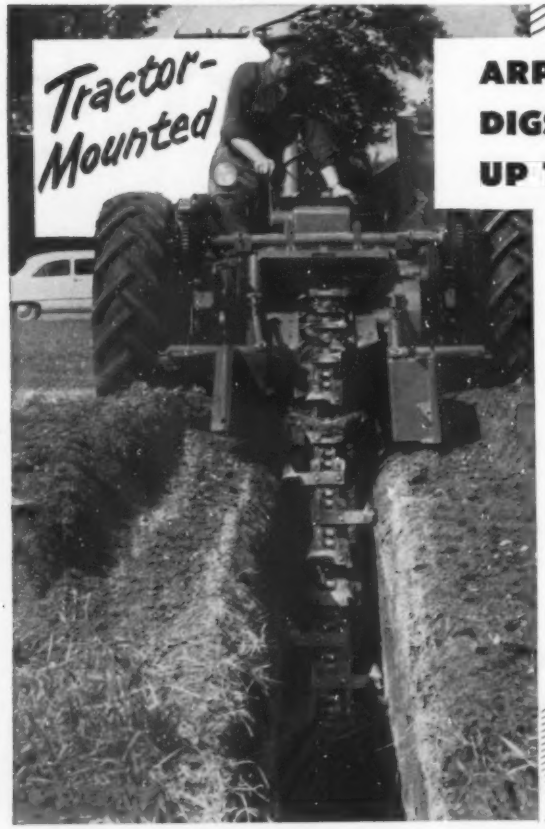
Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Selection and Application Handbook on Comminutors

79. Included in this handbook is a description of Worthington's comminutor line covering its features, dimensions and other information necessary for correct selection and application. Check the reply card or write Worthington Corp., Advertising and Sales Promotion Dept., Harrison, N. J., for Handbook #W-317-B17AP.

(More listings on page 42)



ARPS TRENCH HOG DIGS DEEPER—7', DIGS WIDER—20", DIGS FASTER— UP TO 800' PER HOUR

HERE'S the fast, low cost way to handle most any trenching job — drainage ditches, gas lines, water mains, house service lines, septic tank laterals, foundation footings — dozens of other applications. The tractor-mounted Arps Trench Hog gives you big machine performance with a comparatively low initial investment. Has all the features to make tough jobs easy, plus the mobility only a wheel tractor can provide.

Compare the Arps Trench Hog with similar rigs — no other unit digs faster, deeper or wider. You get trenching speeds up to 800' per hour; depth capacities of 3½', 5½' and 7'; and trench widths of 6" through 20". Exclusive independent speed control for each drive wheel guarantees precise, positive control for straight line digging or curve trenching. Heavy-duty, sealed gear box keeps dust and dirt out — maintenance low. Strong, light tubular frame construction withstands the stress and impact of the toughest digging. Handy optional features include standard and tiling crumbers, one-side dirt delivery, chisel-type cutters and front-mounted angle-dozer for fast backfilling.

See how the Trench Hog can pay off on your trenching jobs. Write today for complete information to the Arps Corporation, New Holstein, Wis., Dept. PW

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CORPORATION
New Holstein, Wis.

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BULL-DOZERS • UTILITY BLADES

"Don't raise the bridge, boys... LOWER THE RIVER"

This favorite punch line of the old music hall comedian actually becomes a reality in the case of this new Highway 40 bridge which is being built right on the ground. Concrete pillars for the bridge are being poured into holes in the ground.

After bridge construction is complete, an underpass will be cut under the bridge. Only then will this unique structure really become a bridge.

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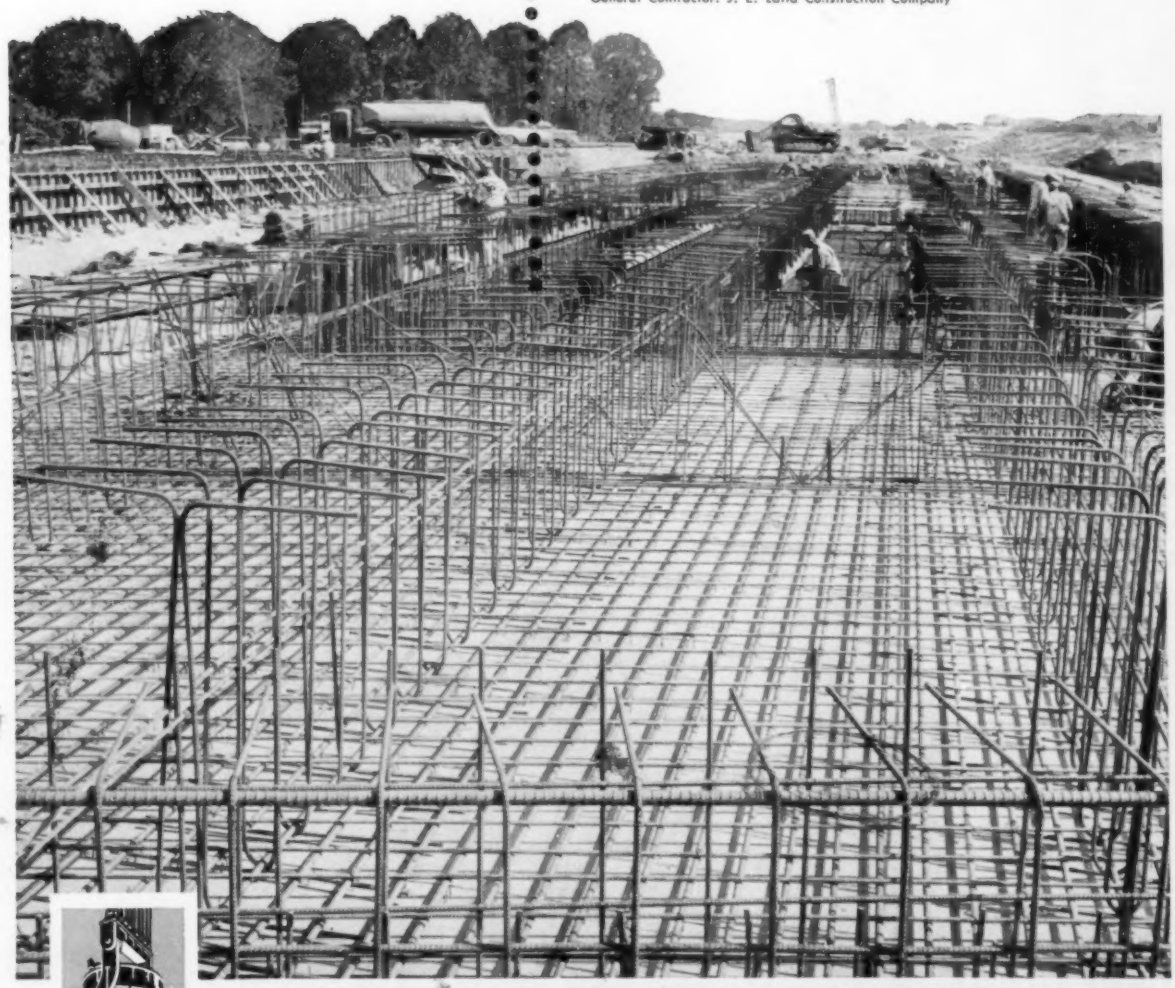
- *welded dowel spacers*
- *multi-rib round reinforcing bars*
- *center joints*
- *tie bars*
- *recess joints*
- *accessories*

Missouri State Highway Commission
General Contractor: J. E. Latta Construction Company



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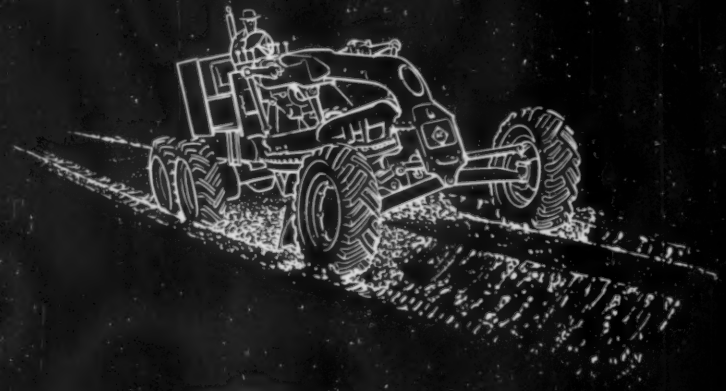

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THE ROLL-AWAY MOLDBOARD MOVES BIG LOADS FASTER

Each portion of blade forces material toward a *different* point. Packing is eliminated. Pressure and friction against blade decreases toward top of blade — no wasted power.

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PURE WATER

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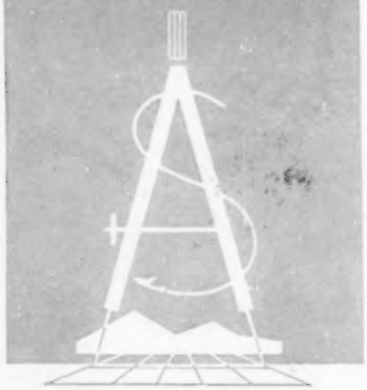

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Advances starting time.

Conserves engineering manpower.

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Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves.

Automatic Engine Control Equipment Manual

83. This catalog contains descriptions of standard automatic and semi-automatic controls and control equipment. General control recommendations, control selection chart, accessory selection chart, safety stop controls and alarm sets are sections covered. For price lists and models available write Synchro-Start Products, Inc., 8151 N. Ridgeway, Skokie, Ill., or check the reply card.

Wha You Should Know About Pipe Locators

94. A new, up-to-date operating manual for pipe detecting instruments has been made available by the Computer-Measurement Corp., 5528 Vineland Ave., No. Hollywood, Calif. Although written chiefly for the Detectron Model 505, it contains operating hints and other information useful with any make pipe detector.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Automatic Valveless Filter

127. Bulletin describes fully the operation of the Permutit automatic valveless filter. The filter can be used wherever gravity flow is feasible. Check the reply card or write The Permutit Co., 50 West 44th St., New York 36, N. Y.

Bulletin on Chlorine Gas Feeders

134. Simplicity of operation and the four types of control are diagrammed of the Builders-Providence Models CVS and DVS chlorinizers in Bulletin 840-N10 just issued by Builders-Providence, Inc., 345 Harris Ave., Providence, R.I. Construction features, operation and application advantages, safety features, dimensions and control variations are discussed. Check the reply card for your copy.

Purification of Swimming Pool Water

153. An up-to-date 64-page manual on purification of swimming pool waters presents a comprehensive discussion of daily requirements, chlorine residuals and feeding methods for hypochlorites and HTH tablets. Available from Industrial Chemicals Div., Olin Mathieson Chemical Corp., Baltimore 3, Md. by checking the reply card.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 7 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the reply card.

All-Electric Floatless Liquid Level Control

174. Descriptions of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest [illegible] for engineering data, diagrams of typical installations and details of component parts. Check the reply card or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

Catalog on Dewatering Pumps

226. Centrifugal and diaphragm pumps for dewatering jobs are described in Catalog DP7 from The Jaeger Machine Co., 550 West Spring St., Columbus 16, O. Models, specifications and performance tables are included. Check the reply card.

What You Should Know About The Centriline Process

197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the reply card for your free copy.

Bell and Spigot Joint Leaks Quickly Repaired

214. Broken water main can quickly be repaired when you have "Skinner-Seal" Bell Joint Clamps on hand. Leaky bell and spigot joints are made lastingly tight with Skinner-Seal Bell Joint Clamps. Get Skinner Catalog GW now—this handsome 48-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily.

Use The Reply Card

Mueller Copper Water Meter Yokes

242. Copper meter yoke provides a tailor-made setting with fewer joints and fittings and it permits the installation of service lines without placing the meter. Check the reply card or write Mueller Co., Decatur, Ill., for complete information.

Centrifugal and Turbine Type Pumps For Water and Sewage Plants

321. Turbine-type pumps, close or flexible couple drive, side suction centrifugal pumps and mixed flow pumps are described in Catalog M available from Aurora Pump Div., The New York Air Brake Co., Loucks at Dearborn, Aurora, Ill. Included is a pump selection guide.

Helpful Data on Water Meters

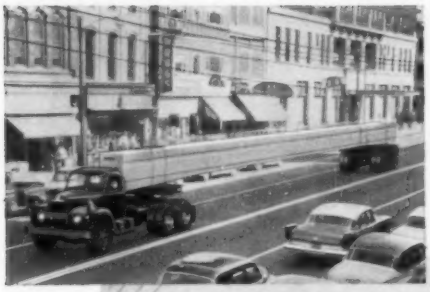
330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wisconsin.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa.

Technical Bulletin on Swimming Pool Filtration Equipment

335. A 24-page technical Bulletin 626, designed to help persons planning pools which must comply with local and state health regulations, is now available from the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. Check the reply card for data on size selection charts, typical installations and drawings.



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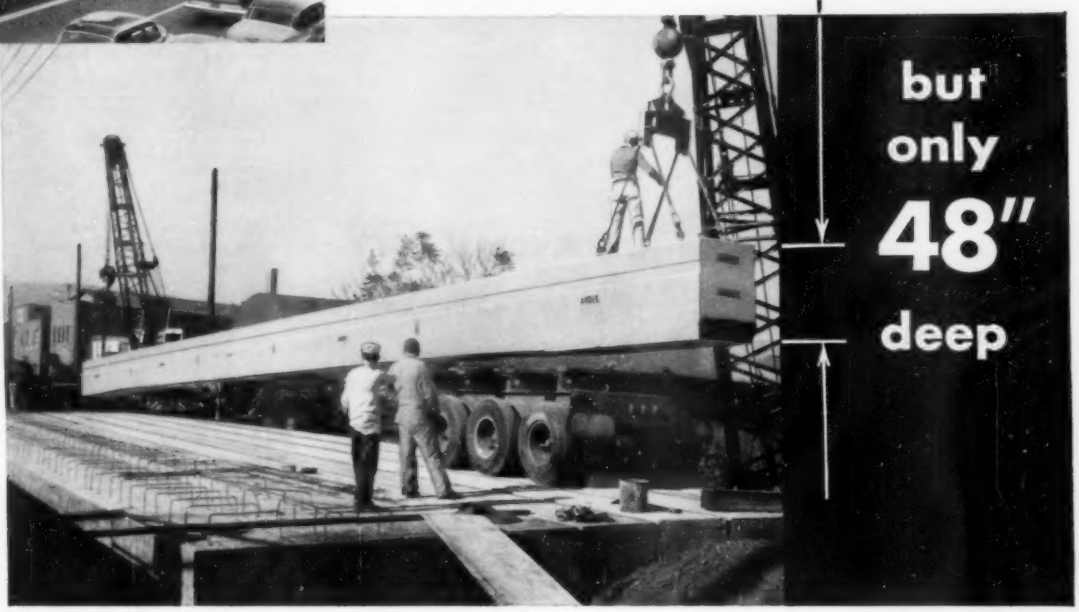

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Fast, trouble-free erection of Amdek concrete bridges has resulted in their widespread acceptance by highway officials, engineers, contractors and the public. Depend on Amdek to provide superior structures on schedule and at low cost.

A "traffic stopper" only on the way to the job, these 103′ lengths of Amdek linear prestressed beams actually prevented a long traffic tie-up for the City of Scranton, Pa. by cutting bridge building time to a few days. And, in spite of their record length, these Amdek members are only 48 inches deep—a minimum depth-to-span ratio that means less weight plus the economies of greater clearance and reduced fill. Amdek linear prestressed beams were selected for this bridge over all other designs because of lower cost . . . speed of erection . . . ready availability of materials and ease of delivery. Before building *your* new bridge, consider these important advantages of Amdek—and write for colorful new brochure illustrating other outstanding features.

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Ferri-Floc FERRIC SULFATE

3 Coagulation over wide pH ranges

4 Rapid floc formation

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The Superior **COAGULANT**

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7 Color removal

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Ferri-Floc gives smoother, more efficient and trouble free operation. Whatever your particular water treatment problem may be, you can depend on Ferri-Floc doing a superior job and doing it efficiently and economically — Ferri-Floc is a free flowing granular salt which can be fed with few modifications through any standard dry feed equipment. It is only mildly hygroscopic, thereby permitting easy handling as well as storage in closed hoppers over long periods of time.

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Efficient coagulation of surface or well waters. Aids taste and odor control—Effective in lime soda-ash softening. Adaptable to treatment of nearly all industrial waters.

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Ferri-Floc coagulates water and wastes over wide pH ranges—it provides efficient operation regardless of rapid variations of raw sewage and is effective conditioning sludge prior to vacuum filtration or drying on sand beds.

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SULFUR-DIOXIDE is effectively used for dechlorination in water treatment and to remove objectionable odors remaining after purification.

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COPPER SULFATE will control about 90% of the microorganisms normally encountered in water treatment plants more economically than any other chemical.

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Let us send you without charge, a 38 page booklet that deals specifically with all phases of coagulation—just send us a postal card.

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617-29 Grant Building, Atlanta, Georgia

Helpful Data on Swimming Pools

364. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg Co., Michigan City, Ind.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Check the reply card.

Welded Steel Pipe from 6 to 10 3/4" Diameter

382. High grade butt welded light-weight steel pipe from 8 to 16-gauge in 20, 30 and 40-foot lengths, plain or asphalt coated, with choice of joints. Also available up to 0.188 wall. Check uses for municipal water lines, irrigation, well casings and many other applications. Self explanatory literature from Valley Mfg. Co., Valley, Nebraska.

Cleaning and Relining Water Pipe the Easy Way

397. Complete facilities for relining cast iron or steel water pipelines in place from 4" to 144" in diameter, with the Spunline (TM), Tate and Centriline Processes offered by Pipe Linings, 2414 E. 223rd St., Wilmington, Calif. For full information on cleaning and relining pipe with only momentary interruption of service, check the reply card.

International 6-Cylinder Carbureted Power Units

398. A graphically-illustrated 12-page catalog CR-511-G, on IHC 6 new 6-cylinder power units is available. Power and fuel consumption curves and cutaway views of component parts of the units are covered. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., for specifications.

Use The Reply Card

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

What You Should Know About the Rubber Waterstop

448. A bulletin on the Servicised rubber waterstop has been released by Servicised Products Corp., 6051 West 65th St., Chicago 38, Ill. General information, engineering service, advantages of specifying the waterstop, specifications, general and detail requirements, installation and typical applications, standard sizes and types are fully covered.

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

U. S. Tyton Joint Pipe

490. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids has been announced. The newly developed Tyton Joint is simple, sturdy and tight. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co. Birmingham 2, Ala., or check the reply card.

Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

NEW TYPE LOADER

WORKS *Faster!*
DOES *More!*

Improved Features Offer Broad Use of Loader

STANDARD LOADER — Increased "ELBOW-ACTION" that provides considerably more "Crowding-Action" permits this unit to be loaded from a standstill without depending on traction of the truck to fill the ¾ yard Bucket. The Upward and Forward arc of the hydraulically-operated forward arms assures extreme flexibility of action without spillage or the need of a cab protector.

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CLAW-TYPE BUCKET—Use of this hydraulically-operated claw greatly speeds up loading by permitting the ¾ yard Bucket to collect up to 25% more stock pile material before being emptied. An ideal unit, for picking up street sweepings, leaves, cinders and other loose materials. The Claw-Type Bucket can be quickly converted to a loader for other trucks by the simple addition of one cross-shaft. Loader can be installed on most any of today's 2, 2½ or 3 Ton Conventional or COE type Trucks. Write factory today for details.

ERNEST HOLMES COMPANY

Chattanooga 7, Tennessee

To order these helpful booklets check the reply card on page 19.

Bulletin Helps Specify A.W.W.A., Gate Valves

547. Double disc gate valves in 2" to 60" sizes are fully described in a 16-page bulletin which gives details on valve parts, design, materials, application of the "O" Ring Seal, operation and operating devices, directions for ordering valves and parts, dimensions of all sizes, and descriptions of eleven different methods for end connections. Valves for horizontal operation, square bottom valves, many types of gearing and gear cases, and a complete listing of special controls available are included. Get Bulletin A from Rensselaer Valve Co., Troy, N. Y. by checking the reply card.

Basic Facts About Fir Plywood Diaphragms

562. General description of diaphragms and how they work, tables showing performance of fir plywood, design examples, cost and grade specifications are covered. Write to Douglas Fir Plywood Assn., Tacoma 2, Wash., or check reply card for this handy bulletin.

Use The Reply Card

Handling Chlorine Liquid and Gas

571. Fischer & Porter Co., 230 Jacksonville Road, Hatboro, Pa., has available Technical Bulletin WWC 3B4 on the handling of chlorine liquid and gas from container to dispenser. It includes pertinent facts about chlorine, lists safety precautions, and outlines recommended practices for designing and constructing chlorine supply systems.

Weir and Flume Meters For Water, Sewage and Industrial Wastes

612. An illustrated 8-page catalog, published by Penn Instruments, Div. of Burgess Manning Co., 4110 Haverford Ave., Philadelphia 4, Pa., describes fully transmission meters, indicating and non-indicating transmitters. It also covers new and novel metering arrangements which have not heretofore been generally used in water and sewage plant installations. Check the reply card.

Handbook on Selecting Power For Pumping

694. A 12-page power selection handbook, "Selecting Power For Pumping," has been released by the Advertising Div., Caterpillar Tractor Co., Peoria, Ill. This handbook is especially useful to those who have a pumping operation. It contains a checklist of features necessary for continued dependable operation on pumping jobs. List describes the proper requirements which an engine must have, backing them with illustrations and examples of efficient installations. Check the reply card today.

Locate Water Leaks Quicker and Easier

748. An aquaphone that requires no mechanical connection between probe and diaphragm to break or cause of trouble is described fully in literature from Aqua Survey & Instrument Co., 2012 Leslie Ave., Cincinnati 12, Ohio.

SEWERAGE AND WASTE TREATMENT

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

How and Where to Install A Septic Tank System

270. A manual on modern sewage disposal methods for individual dwellings, camps and rural schools has been released by Brown Co., 150 Causeway St., Boston, Mass. Location, size of and building the tank, how large a disposal field and laying out the field are discussed.

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Manual on Sewer Structures

178. This is a 48-page manual on installation design, reference data and graphs showing discharge of pipe based on Manning's formulas. Also such subjects as structural durability, material durability; selection of structures; factors influencing capacity; joints and fittings; and linings for failing sewers are covered. Copies of Manual CMS-7456 are available from the Product Information Service, Armco Drainage & Metal Products, Inc., Middletown, Ohio, or by checking the reply card.

Amvit Mechanical Jointed Clay Pipe

298. The new Amvit jointed vitrified clay pipe in sizes 4 through 24 inches with the true "built in" mechanical joint ready for immediate and easy installation is infiltration and root-proof. Offers better flow and less maintenance and permits deflection and absorbs shocks. It is furnished on all standard fittings and permits immediate backfilling and testing. For literature write to American Vitrified Products Co., National City Bank Building, Cleveland, Ohio, or check the reply card.

Let us show you how to cut mowing costs

(Photo by The Davey Tree Expert Company)

Accurate records over a three-year period showed that weed and brush control along highways costs better than $100 a mile when mowing was the basic control method.

Comparative tests over the same period proved that a combination of chemical control with fewer mowings did a better job at far less cost. Moreover, chemicals could be applied the full width of the right of way—30 feet or more back from the roadway.

As one of the world's largest makers of herbicides, DIAMOND has the experience and technical facilities to help you map out a reliable chemical control program that avoids pitfalls. Why not contact us and let us show you how to cut highway maintenance costs? Just write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, Ohio.

Diamond Chemicals

Important Angle

There are many things about street lighting poles—*details* of construction, materials and assembly—that add up to a mighty important angle. They make a big difference *through the years!*

Monotube poles give lasting satisfaction. They are backed by years of research, development and experience!

For catalogs or specific engineering data, write to The Union Metal Manufacturing Company, Canton 5, Ohio

In Canada: The Union Metal Manufacturing Company of Canada, Limited, Brampton, Ontario.

LIVE BETTER ELECTRICALLY

UNION METAL

Monotube Lighting Poles

To order these helpful booklets check the reply card on page 19.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the reply card or write to the manufacturer and ask for Bulletin TR-94A.

Dependable Engines for Sewage Treatment Plants

227. Climax Sewage Gas Engines are available for continuous duty operation to drive pumps, blowers or generators in a range of sizes from 40 to 250 HP. Use the handy reply card to obtain complete details and literature from Climax Engine Manufacturing Co., 208 S. La Salle St., Chicago 4, Ill.

Chapman Standard Sluice Gates

276. Manual, hydraulic or electric motor control sluice gates are described fully in Catalog 25 available from The Chapman Valve Mfg. Co., Indian Orchard, Mass. These valves are easy to replace and are fitted without alterations. Check the reply card.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy reply card or write Combustion Engineering Inc., Raymond Div., 1315 No. Branch St., Chicago, Illinois.

Air Lift Pump Units For Low Lift Pumping

340. Air lift pumps for low lifts in sewage and water treatment plants are described in Bulletin 22S7548 available from Walker Process Equipment Inc., P. O. Box 266, Aurora, Ill. Complete details with drawings, selection charts and application formulas; as well as curves showing capacities and operating characteristics are covered. Check the reply card.

Digester Capacity Requirements Are Substantially Reduced

284. A 16-page, two-color bulletin, "The Dorreo Densludge Digestion System" is now available from Dorr-Oliver Inc., Barry Place, Stamford, Conn. Describes the development, equipment, operation, typical applications and design loadings of this new sludge digestion system. Explains how digester capacity requirements are substantially reduced. Included are wash and line drawings and photographs of the various equipment units. Check the reply card.

Complete Story of Rubber as a Coupling Medium in Pipelines

295. "Joint Enterprise", a booklet describing Tylox rubber joints for coupling pipe used in sewerage, drainage and waterworks projects is now available from Hamilton Kent Manufacturing Co., 7 West Grant St., Kent, Ohio. The booklet also contains illustrated case histories of Tylox-Jointed installations, and suggestions to assist engineer in specifying Tylox joints for both tongue and groove, and bell and spigot pipe. Check the reply card.

Use The Reply Card

Device Used to Regulate Flows of Liquids

396. Valuable data on details of design, capacities, dimensions and typical installations of the Simplex Type 5 Controller are covered in literature from Simplex Valve & Meter Co., 7 East Orange St., Lancaster, Pa. The unit regulates flow of liquids in filter plants and is used to maintain a uniform rate of filtration through each filter unit. Check the reply card.

Diaphragm & Plunger Type Dual Valve Sludge Pumps

411. A 4-page bulletin on diaphragm and plunger type dual valve sludge pumps is available from Komline-Sanderson Engineering Corp., Peapack, N. J. Sludge pump is designed for feeding sewage to vacuum filter and the diaphragm pump is intended for pumping heavy slurries. Check the reply card for complete descriptions and selection charts.

Vitrified Clay Floor System For Trickling Filters

452. The IMCO two unit floor is noted for its mechanical strength, simplicity of construction and large percentage openings for aeration. The units are self spacing and easily set in place. Check the reply card or write Industrial Materials Co., Somerset St. and Trenton Ave., Philadelphia 34, Pa., for complete catalog.

Pneumatic Ejectors—Their Operation and How to Select the One You Need

500. Comprehensive data on pneumatic ejectors is furnished in a 28-page catalog issued by the Ralph B. Carter Co., 210 Atlantic Street, Hackensack, N. J. The principle of operation, construction features, operating arrangements and controls are discussed fully. Selection charts with illustrative examples help in specifying the proper ejectors, air tanks and compressors. Complete layout dimensions and sample specifications are included. To get this valuable reference, Bulletin 5408, just check the handy reply card.

Trickling Filter Systems For Small Sewage Plants

506. Trickling filter systems for the small sewage treatment plant, such as required for isolated, institutional, industrial and residential developments, are detailed in a 24-page manual available from Yeomans Brothers Co., 2000-1 North Ruby St., Melrose Park, Ill. In addition to the trickling filter distributors the catalog also gives specifications and suggested sizes for the Spiragster. Check the reply card for Manual 6769.

Controls For Use in Pumping Stations and Sewage Plants

662. Single and multi-pump sump controls, pressure operated for use in pumping stations and sewage disposal plants are described in literature available from Healy-Ruff Co., Water Level Controls Div., 2255 University Ave., St. Paul 14, Minn. The two principal types of pressure operated sump controls are covered along with general descriptions and features. Check the reply card.

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To order these helpful booklets check the reply card on page 19.

Spiragester, A Combination Clarifier and Digester

709. A 22-page catalog is available from Lakeside Engineering Corp., 222 W. Adams, Chicago, Ill. describing the Spiragester. Check the reply card for operation of the unit, advantages, specifications, samplers and painting.

Chemical to Control Sewage Odors

726. Cloroben is a sanitation chemical that provides control of sewage odors in treatment plants, septic tanks, cesspools and chemical toilets. Write Cloroben Chemical Corp., 115 Jacobus Ave., South Kearney, N. J., or check the reply card for applications and performance data.

CONSTRUCTION EQUIPMENT AND MATERIALS

How to Select Prestressed Concrete Bridge Members

26. Colorful folder, well illustrated, shows manufacture of "Amdek" prestressed bridge members and provides selection tables covering several AASHO loadings. Full data from Concrete Products Div., American Marietta Co., 104 East Ontario St., Chicago 11, Ill. Check the reply card for your copy of this helpful reference bulletin.

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 180° arc and dig to a depth of 12 feet. For full details check the reply card. Sherman Products, Inc., Royal Oak, Mich.

Concrete Bridge Details

58. An illustrated 48-page booklet, published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill., calls attention to good and poor practice in bridge building. It also shows how to improve improper details and open the way for use of higher stresses. Write to PCA for your copy or check the reply card.

Sidecrane-Backfiller-Tamper, A Versatile 3-Way Machine

125. A 3-way machine, the Cleveland 80W, that is a backfiller, sidecrane and tamper is described fully in a 12-page Bulletin, No. L-102, available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Design and construction features, photographs of the machine in operation and complete dimensions and specifications are covered. Check the reply card.

For Prompt Service Use The Reply Card

Complete Line of Concrete Gunning Equipment

208. A 16-page catalog that gives complete details, specifications and operating capacities of concrete gunning equipment and answers to many of the questions asked about air placed or gunned concrete is available from Air Placement Equipment Co., 1009-11 West 24th Street, Kansas City 8, Mo. Also included are several pages of actual job application photographs showing the many and varied uses of this modern equipment.

Valuable Information on Concrete Testers

210. Concrete compression testers and flexure testing machines, portable concrete testers, and testing machines for concrete, clay and tile pipe are described fully in Bulletins from Forney's Inc., Tester Div., P. O. Box 310, New Castle, Pa. Check the reply card for complete information on models and specifications.

Utility Tractor For Construction and Maintenance

232. Bulletin CR-1333-G describes the performance and handling ease of the International 350 utility tractor. Advantages, special features and specifications are included. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Manual on Coatings to Stop Rust

235. Primer type, short oil type, heat resistant, chemical resistant and floor coatings are a few of the items covered. Also complete data on Rust-Oleum products are included. Check the reply card or write Rust-Oleum Corp., Evanston, Ill., for this valuable manual.

Catalog on Utility Bodies and Equipment

360. General service bodies, line construction bodies, aerial equipment, winch and derrick equipment and trailers are the units covered in this catalog. For design, dimensions, illustrations and descriptions check the reply card or write McCabe-Powers Auto Body Co., 5900 N. Broadway, St. Louis 15, Mo.

Bridge Concreting, Its Problems and Solutions

390. A 16-page catalog illustrating the concreting problems involved in bridge construction is available from The Master Builders Co., Cleveland 3, Ohio. The catalog covers concreting of piers and bridge decks for highway and railway bridges, and includes discussion of hot and cold weather concreting, the use of lightweight aggregate in bridge work; and placing and finishing problems encountered in bridge work. Check the reply card for Catalog MBR-P-11.

4-Wheel Drive Tractor Loaders

434. A 16-page Catalog, No. 1033-5-57, describing the "Tracto-Loader Line" of front end wheel loaders is available from Tractomotive Corp., Deerfield, Ill. Covered are the five models that are in production.

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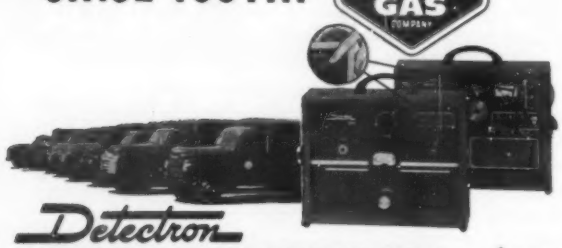

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"505" PIPE DETECTORS -- have been used by Southern Calif. Gas Company

Serving 4,800,000 persons with more than 13,787 miles of main lines.

more than 200 now in use performing ALL these jobs!

• Detect, trace and center pipes, cables, etc.

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Maximum efficiency in every operation is the key to the low consumer rates offered by this leading utilities company. Damage or breakage of existing pipeline during street excavation was a costly, time consuming problem — solved by equipping all service and repair trucks with a modern electronic pipe detector.

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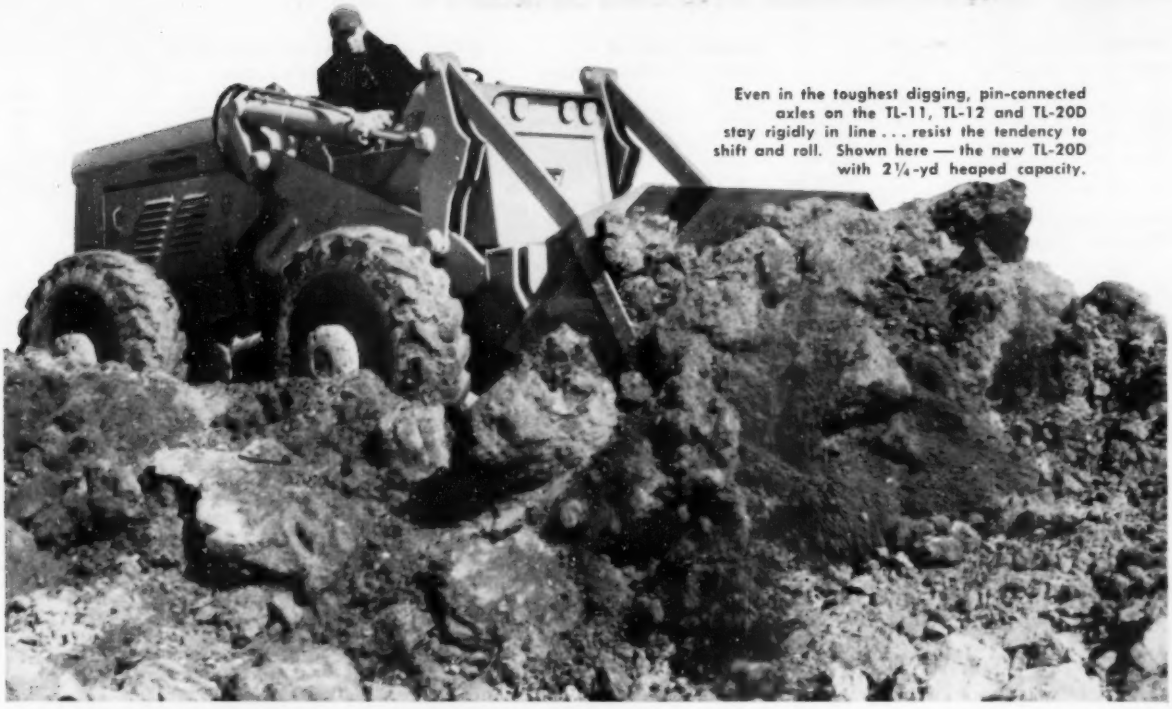
Manufactured in new, modern continuous mills to specifications per ASTM — A 139 Grade B; which also conforms to API 5L standards. Automatic electric butt welded process, using CO_2 gas. Pressure tested. Ideal for use as line pipe for gas and oil, for municipal water systems and irrigation, high velocity tubing for air conditioning and heating, heat exchangers, well casing, grain and mineral spouting, mining, signs, as well as many other manufacturing and industrial uses.

Available in 6", 6⅝", 8", 8⅝", 10", 10¾", 12", 12¾", 14", 16" diameters; from 14 gauge up to and including .219 wall thickness; 20, 30 or 40 foot lengths; in plain or belled ends. Quotations available for Victaulic or Dresser end processing, and coating and wrapping.

Available for immediate delivery.

VALLEY Manufacturing Company Valley, Nebraska

Write or call for full specification and production data to: Steel Pipe Division



Even in the toughest digging, pin-connected axles on the TL-11, TL-12 and TL-20D stay rigidly in line . . . resist the tendency to shift and roll. Shown here — the new TL-20D with 2¼-yd heaped capacity.

FOR EXTRA STRENGTH . . .

TRACTOLOADER® axles are pin-connected directly to frame

No Rolling and shifting under load!
Another example of TRACTOMOTIVE quality construction

You profit from Tractomotive's experience building 20,000 rugged crawler loaders. This design know-how goes into its TRACTO-LOADERS. That's why drive axles on the heavier TRACTO-LOADERS are pin-connected directly to the frame with 2-inch diameter steel pins instead of by the usual U-bolt method. There is no possibility of "play" . . . no bolts to work loose . . . no mounting plates to warp out of shape.

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Here is one more reason why you get higher production . . . lower upkeep with TRACTOLOADERS.

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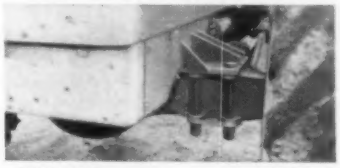
THERE IS A FAST-WORKING TRACTOLOADER TO FIT EVERY JOB — 5 MODELS — ½ cu yd to 2¼ heaped . . . two and four-wheel drive.

BIG Loaders Need BIG Loader Construction

TRACTOMOTIVE AXLE is attached to frame with 2-inch diameter steel pin with 6 inches of bearing surface.



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TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

To order these helpful booklets check the reply card on page 19.

Davis Back-Hoe and Davis Loader

312. Literature is available from Massey-Ferguson Industrial Division, Massey-Harris-Ferguson, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis backhoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

High Capacity Continuous Mix Asphalt Plants

334. A 34-page, 3-color catalog describes all of the components of Barber-Greene's Model 848 continuous-mix asphalt plant. Check the reply card or write Barber Greene Co., Aurora, Ill., for information on the mixer, several varieties of dryers, dust collectors, elevators and bins.

Tractor-Shovels With Drott "Four-In-One" Attachment

352. Hough rubber-tired front-end loaders come equipped with the Drott "4-in-1" bucket. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill., for literature on how to use this unit as a shovel, clamshell, scraper and bulldozer.

Hydraulic Backhoe For Many Makes of Tractors

456. A backhoe that digs sewer systems, culverts, water mains, foundations and ditches is described fully in literature from Henry Mfg. Co., Inc., 1700 N. Clay St., Topeka, Kans. Check the reply card for specifications and details.

Agent For Improving Adhesion Between Old and New Concrete

530. Thorobond liquid bonding agent for improving adhesion of new concrete to old concrete walls, floors and ceilings is described in literature available from Standard Dry Wall Products, Inc., New Eagle, Pa. Check the reply card for information on typical uses and methods of application.

Complete Line of Asphalt Patching Mixers

586. Mixers capable of mixing 3 to 24 tons of hot mix per hour are described in literature available from McConnaughay Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

1/2-Yard Trencher and Swing Loader

651. The Oliver ½-yard trencher and swing loader is described fully in literature from The Oliver Corp., 400 West Madison St., Chicago 6, Ill. Check the reply card for features, operation and uses of this trencher.

•

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 320 Market St., San Francisco 20, Calif.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks, streets and factory floors solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a 16 page catalog by Koehring Division, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the reply card.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy reply card for full data. Ernest Holmes Co., Chattanooga, Tenn.

How to Prepare and Maintain Roadways With Calcium Chloride

65. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

Use The Reply Card

A Street Sweeper For Every Sweeping Need

158. A new catalog containing eight pages of illustrated information on street sweeping with the Mobil Sweeper, motor pickup type street sweeper, is just off the press. It is used on streets, highways, airports, parks, parking areas and other paved areas. For your copy write Mobil Sweeper Div. of the Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif., or check the reply card.

How To Build Stabilized Heavy Traffic Pavements

233. A 16-page booklet published by Seaman-Andwall Corp., Milwaukee, Wis., shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worth-while booklet for every highway engineer. Check reply card for copy.

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Model AL
SYNCHRO-START Safety Alarm Sets contain all the necessary relays, switches, and signal lights to warn the operator of any abnormal condition existing in the engine.
Three switches are provided — control "on-off" — test — audible alarm cut-off. For added protection these alarm sets may be equipped with automatic shut-down in case signals are not heeded.
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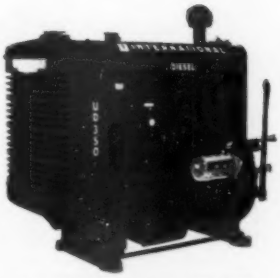
Call him in and get his estimate on your next repower job. You'll like production-boosting International power and the service support you get from the man who sells it.



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To order these helpful booklets check the reply card on page 19.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic sign faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Equipment For Highway Stabilization

363. The Roto-Mixer and Preparator are machines available for low-cost road building and stabilization. For operation uses and specifications get literature from Road Machinery Div., Bros Inc., Minneapolis 14, Minn., or check the handy reply card.

What You Should Know About a Motor Grader

673. Photographs, sketches and other instruction illustrations aid readers to visualize details of the Allis-Chalmers Model Forty-Five motor grader mechanical features and components. The catalog also tells about attachments and accessories. Write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc.

Information on Trucks for Every Job

442. Literature on the complete IHC truck line is available from International Harvester Co., 80 North Michigan Ave., Chicago 1, Ill. Included is information on basic models, conventional and COE, 4-wheel, 6-wheel and four-wheel-drive. Check the reply card.

Convenient Data on Tandem and 3-Wheel Rollers

449. This manual covers everything on the variable weight, 5-8, 8-10, 8-12 and 10-14 ton tandem rollers and on the standard and variable weight, 8, 10, 12, 14 ton and 8-10, 10-12, 12-14 ton 3-wheel rollers. Covered are the frame, transmission, final drive, front end and operator's controls. The designs, construction, performance and service of the rollers are fully outlined. There are plenty of illustrations along with a complete set of specifications for each roller model. Available from Huber-Warco Co., Marion, Ohio, or check the reply card.

Pre-Assembled Dowel Units For Highway and Airport Construction

537. Laclede dowel assemblies for expansion, contraction and construction joints are precision welded into one unit and are maintained in rigid alinement. For full details write Laclede Steel Co., St. Louis, Mo., or check the reply card today.

Prices and Specifications On Engineers Transits

563. General information on the operation of transits, causes of instrumental errors, cleaning and lubrication and adjustments are covered in available literature. For specifications, prices and ordering write Atlas Instrument Co., 705 Douglas St., Sioux City, Ia.

Hydrocrane Used As A Backhoe, Crane or Clamshell

606. When your work calls for lifting, digging and trenching all in the same day you need a machine that converts from crane to clamshell to hoe quickly and easily. Check the reply card or write Bucyrus Erie, South Milwaukee, Wisc. for information on the Hydrocrane.

A Completely Hydraulic Ladder

610. This completely hydraulic ladder is described in a new catalog published by J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio. Detailed drawing of the pedestals, throttle control and ladder construction are included. Check the reply card today.

Warn Lock-O-Matic Hubs Manual

618. Warn Hubs make 4-wheel drive more useful, because they make it into a "free-wheeling" 2-wheel drive, as well as a 4-wheel drive. The Lock-O-matic hubs reduce front end wear, engine load and gear whine. Check the reply card or write Warn Mfg. Co., Riverton Box 6064, Seattle 88, Wash.

Light Duty Trucks For Construction and Maintenance

628. Pickup and stake body trucks are fully described in literature from Ford Div., of Ford Motor Co., Dearborn, Mich. Pickups are available in 6½, 8 and 9-ft. lengths. They come in standard colors and with either a 6 or V-8 engine. Rigid tailgate and steel corner posts add to the over-all body strength. The stake body trucks come in 6½, 7½ and 9-ft lengths. These units also come in 6 or V-8 engines. Check the reply card for full information.

Catalog on Road Rollers and Compaction Equipment

667. Two and 3-axle tandem rollers, 3-wheel variable weight rollers and the Kompactor are covered in this catalog from Buffalo-Springfield Roller Co., Springfield, Ohio. Specifications, models and features are included. Check the reply card today.

WEED AND DUST CONTROL

How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.

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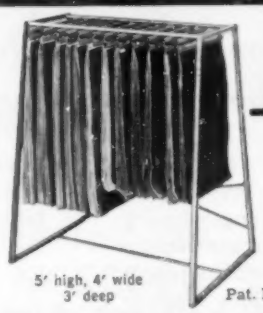

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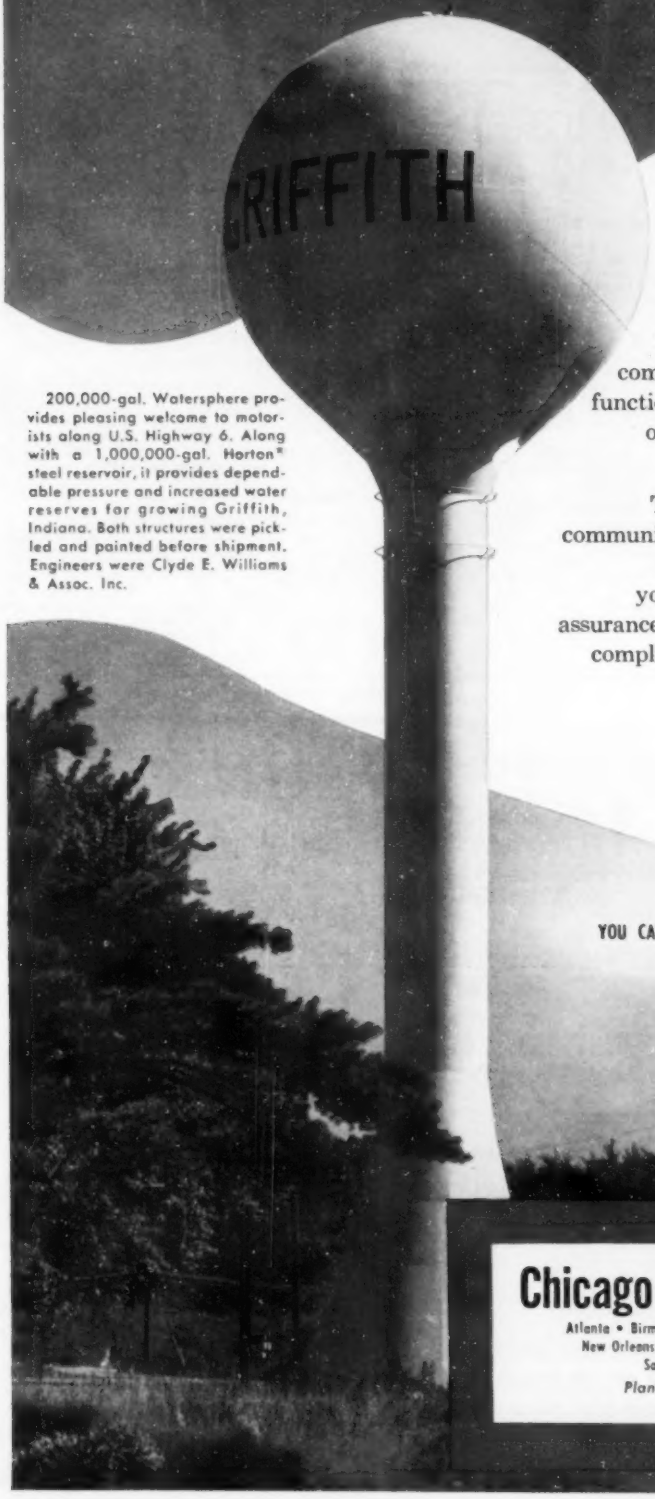
WATERSPHERE



200,000-gal. Watersphere provides pleasing welcome to motorists along U.S. Highway 6. Along with a 1,000,000-gal. Horton® steel reservoir, it provides dependable pressure and increased water reserves for growing Griffith, Indiana. Both structures were pickled and painted before shipment. Engineers were Clyde E. Williams & Assoc. Inc.

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Ask for the *Watersphere* and
Waterspheroid® Bulletin.

YOU CAN BE SURE WITH STEEL . . . AND CERTAIN WITH CB&I.

CBI

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY,
GREENVILLE, PA. and NEW CASTLE, DEL.

To order these helpful booklets check the reply card on page 19.

REFUSE COLLECTION AND DISPOSAL

Developments in Refuse Collection

119. The "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 7, Tenn. Check the reply card today.

Refuse and Garbage Packer Bodies

241. Ranging in capacity from 12 to 24 cu. yds., the M-B packers have a 30 second compaction cycle and have large side loading doors. Write M-B Corp., New Holstein, Wisc., or check the reply card for bulletin on specifications.

General Specifications for Refuse and Garbage Trailers

251. Two bulletins, one on the Pak-Mor 38 cu. yd. tandem axle trailer unit and the other on the Pak-Mor 32 cu. yd. trailer for use with Model GRD Dempster are available from Pak-Mor Manufacturing Co., Box 6147, San Antonio, Texas. General specifications, power train, operating procedures, maintenance and lubrication and other helpful information are included.

Planning A Sanitary Landfill

287. Covered in this manual is how to work various types of terrain efficiently for sanitary landfills. Swampy land, river bottom land, gravel pits, strip mines, and flat land operation are the sections. Write to Caterpillar Tractor Co., Peoria, Ill., or check the reply card for your copy.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

Complete Package Dravo Incinerator Plant

584. The Dravo incinerator includes receiving pits, automatic refuse handling system, automatic combustion controls, traveling grate stoker and everything necessary for the efficient operation of the plant with minimum personnel. Write for full information to Dravo Corp., Dravo Building, Pittsburgh 22, Pa., or check the reply card.

Data on Refuse Collection Bodies

615. The Hydro E-Z Pack compacting unit has only 2 working parts—a high volume roller bearing pump and a double-acting telescopic cylinder. A refuse-crushing compacting pressure of 82,500 lbs. is attained in the units. Write Hydro E-Z Pack Co., Galion, O., or check the reply card for complete specifications.

SNOW AND ICE CONTROL

Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. Check reply card for your copies.

STREET LIGHTING AND TRAFFIC CONTROL

Residential Street Lighting

228. A new 16-page bulletin on residential street lighting is now available from the General Electric Co., Schenectady 5, N. Y. Well illustrated, the bulletin, designated GEA-6316, explains how good lighting benefits a residential community and provides information on how to plan modern residential lighting installations.

Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by the Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

PR System of Coordinated Traffic Signal Control

589. This bulletin describes the PR local controller which carries out the directions of the Electro-Matic Master in the all-electronic equipment for coordinated traffic signal operation. Check the reply card or write Automatic Signal Div., Eastern Industries, Inc., Norwalk, Conn., for this valuable bulletin.

Engineering Guide on Mercury Street Lighting

640. Technical data on mercury lamps applicable to general lighting service, operating characteristics of the mercury vapor lighting system and economic evaluation of lighting systems designed for equal lighting results are several of the sections covered in catalog from Westinghouse Electric Corp., Lighting Div., Edgewater Park, Cleveland, Ohio.

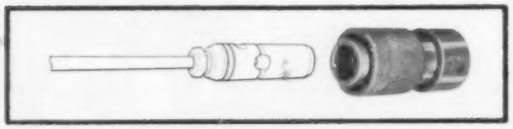
with the new SPEEDI-CHUCK

it's a S-N-A-P

TO CONNECT SEWER RODS TO POWER DRIVE*

Spring-loaded snap lock . . . no Coupling Pin or Spring to get lost

1. Pull Collar Back
2. Insert Rod Coupling
3. The Groove around Coupling makes Connection



Easily installed on any Flexible 2 h.p. Power Drive

Shown installed on PD-50-RL Quick Reverse Power Drive

FLEXIBLE INC.

1005 SPENCERVILLE ROAD, LIMA, OHIO
3786 DURANGO AVE., LOS ANGELES 34, CALIF.
351 W. JEFFERSON BLVD., DALLAS, TEXAS

4:30 p.m.
Conditions hazardous

5:15 p.m.
Rush hour traffic moves safely

COLUMBIA CALCIUM CHLORIDE

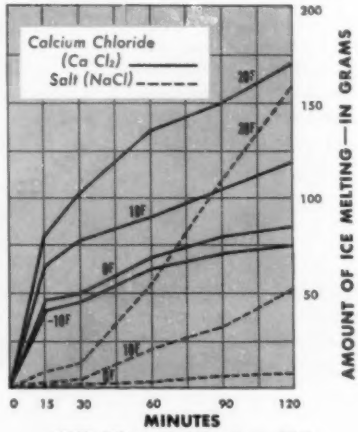
makes streets and roads safe faster

Speedy ice and snow control keeps towns and highways running smoothly, holds fatalities and injuries down. And here are new test results proving once again that Columbia Calcium Chloride brings safety to surfaces *faster*. This skid-proofing chemical melts *8 times as much ice* within thirty minutes after application as is melted by salt. Here are comparative results over a two hour period: ▶

Better order an ample supply of Columbia Calcium Chloride today through your nearest Columbia-Southern District Sales Office.

AMOUNT OF ICE MELTED
15 TO 120 MINUTES

350 Grams ice in 7" by 11" pan
40 Grams chemical (based on 100% NaCl or $CaCl_2$)



NOTE: NO reaction with salt at —10 F.

Columbia Calcium Chloride is available in both High Test Flake (94-97% $CaCl_2$ content) and Regular Flake (77-80% $CaCl_2$).

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte
Chicago • Cleveland • Boston • New York
St. Louis • Minneapolis • New Orleans
Dallas • Houston • Pittsburgh • Philadelphia
San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

Safeguard Winter Traffic with Columbia Calcium Chloride

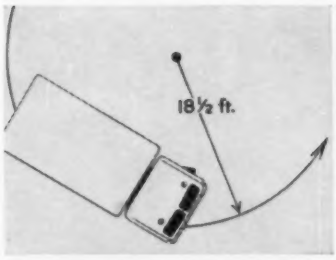
INTERNATIONAL tilt-cab COE models cover the range from 21,000 to 41,000 lbs. GVW – a total of 66 four- and six-wheelers. Powered by famous "sixes" and new V-8's–gasoline and LPG–and dependable diesels with horsepower from 165 to 335. All carry bigger loads on shorter wheelbases with better weight distribution.

Here's a unique double-duty vehicle–the new INTERNATIONAL Travelette! Seats six big people comfortably in two full-width seats! Hauls up to a full ton payload in the all-steel 6-ft. pickup body. Service-utility body and four-wheel-drive models available.

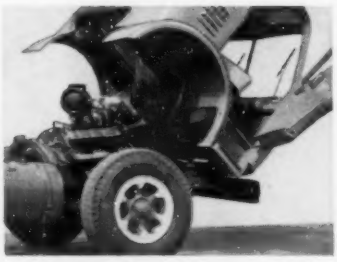
INTERNATIONAL TRUCKS

Easier Handling

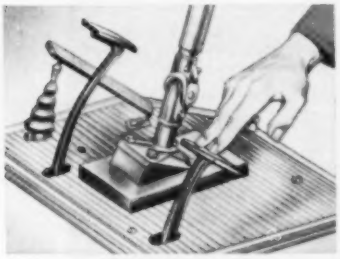
Just one reason why you'll find International Trucks cost least to own!



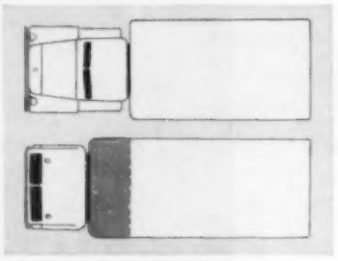
Shorter turning and easier handling with COE's that have turning radii as short as 18½ feet. Save time and effort.



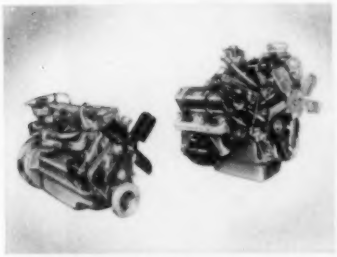
Save service time and money. Cab swings forward for complete access to the engine and all accessories.



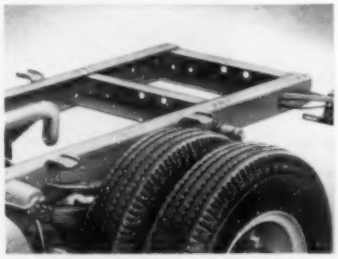
Easier driving with 25% less pedal pressure due to exclusive clutch design with roller-mounted release fingers.



Bigger payloads on shorter wheelbases with BBC dimension of only 81 inches. Ideal weight distribution.



Economical, usable horsepower at low rpm. Wide choice of engines to performance-match every hauling job.



Plenty of strength for the biggest loads on any job with frames that have extra rigidity and proper flexibility.

Driving in close quarters requires trucks that make tight turns. Turning circles of INTERNATIONAL cab-over-engine models are as much as *8 feet* less than conventional units! Result: Easier handling, greater maneuverability that save effort and time.

Only INTERNATIONAL can offer "tailor-made" trucks that do the job easier, longer and at least cost because INTERNATIONAL builds the *most* complete line of trucks.

It's true—when you get the "one" truck you need and want, you save money all along the line. Cost records prove it. They show INTERNATIONAL Trucks cost *least* to own.*

Contact your INTERNATIONAL Truck Dealer for a convincing demonstration, today.

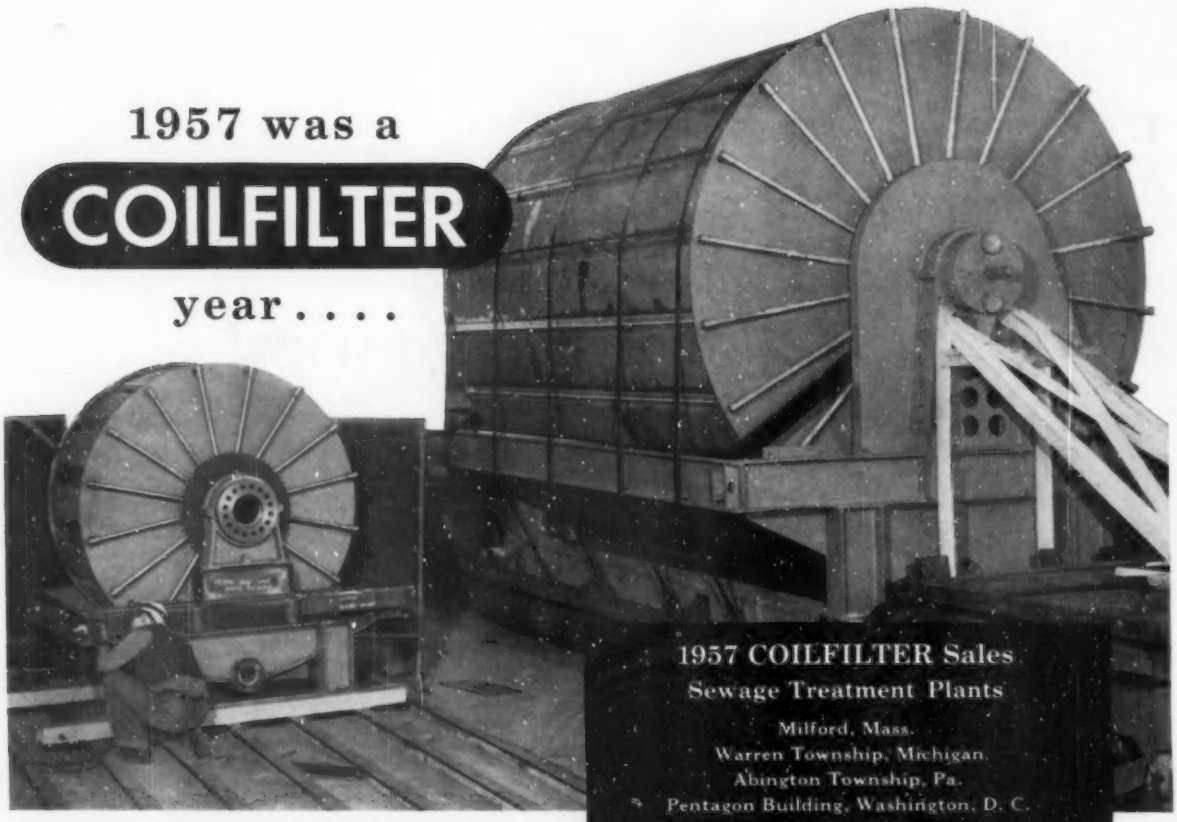
**Signed statements in our files, from fleet operators throughout the U.S., back up this statement.*

cost least to own!

INTERNATIONAL HARVESTER COMPANY. CHICAGO

Motor Trucks • Crawler Tractors
Construction Equipment • McCormick®
Farm Equipment and Farmall® Tractors

1957 was a COILFILTER year....



. . . and from present indications 1958 will also be a year in which COILFILTERS again will be preferred by most Consultants in the Sanitary Engineering field.

We wish to express our gratitude to the engineers, operators and public officials who have shown their confidence in COILFILTERS. We intend to keep improving and producing the finest product in its field.

Illustrated above; "the big and little of it". The largest and smallest standard COILFILTERS being prepared for shipment to plants in Yorkville, Ohio and Warren, Michigan, respectively.

1957 COILFILTER Sales
Sewage Treatment Plants

Milford, Mass.
Warren Township, Michigan
Abington Township, Pa.
Pentagon Building, Washington, D. C.
Carthage, Mo.
Lackawanna, N. Y.
Ridgeland Water Company,
Worth Township, Ill.
Hastings, Neb.
Hamilton, Ohio
Salem, Ill.
Oklahoma City, Okla
Perth Amboy, N. J.
Winchester, Va.
Clearwater, Fla.
Carlisle, Pa.
Bethel, Pa.
Corsicana, Texas
Elizabethton, Tenn.
Lebanon, Ind.
Resources Development Corp.,
Willingboro Township, N. J.
Cozad, Neb.
Yorkville, Ohio
Two Harbors, Minn.
Belvidere, Ill.
East Ridge, Tenn.
Sewickley, Pa.
Dubuque, Iowa
Easton, Pa.
Spring Valley, N. Y.
Ashland, Ohio
Bucklin Pt., R. I.
Willimantic, Conn.
Elizabeth, Pa.
Penn Township, Pa.
Nassau County, N. Y.

KOMLINE-SANDERSON ENGINEERING CORPORATION
PEAPACK, NEW JERSEY

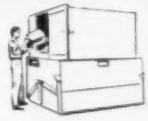
Manufacturers of **COILFILTER** *sludge vacuum filters*

winner of $32,000 on "The $64,000 Question"

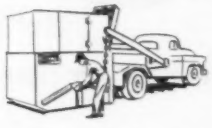
George R. Dempster Says . . .

$32,000.00 Is a Lot of Money

...but many cities save more than that every year with the Dempster Dumpster!



"Containerized" rubbish . . .



is picked up . . .

hauled . . .

and dumped

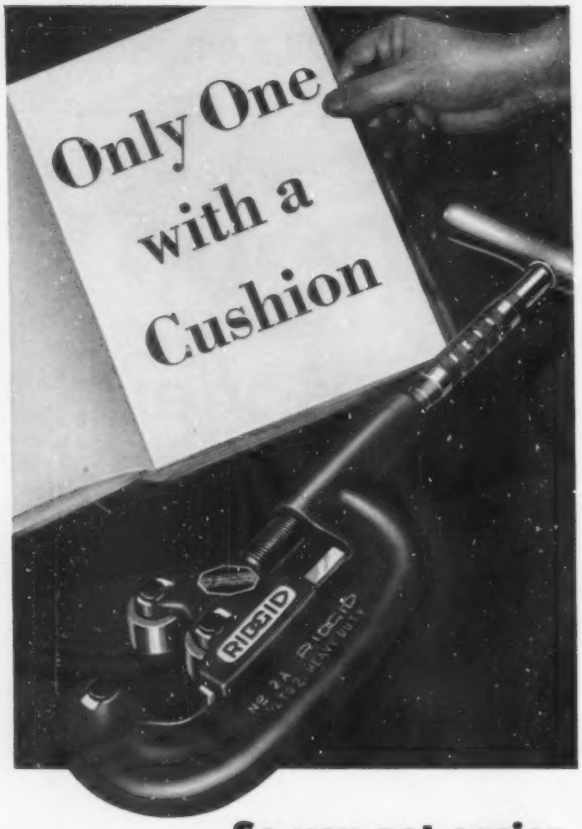
It's a fact! Your city, like hundreds of others, can save taxpayers thousands of dollars every year with our Dempster-Dumpster System of rubbish disposal. Using this low-investment System, one man and one truck-mounted Dempster-Dumpster can handle the entire bulk rubbish accumulation in the commercial district of a good-sized city. The savings are obvious . . . the improvement in city "housekeeping" is astonishing! Merchants love the big, clean Dempster-Dumpster Containers, which provide enclosed rat-proof, fly-proof, scatter-proof storage of rubbish and refuse. Don't let these savings and advantages get away — start checking your bulk waste disposal costs today.

WRITE TODAY for complete information on our two new time-payment plans.

Dept. PW-2, DEMPSTER BROTHERS, Knoxville 17, Tenn.

America's Leading System of Bulk Rubbish Disposal

THE DEMPSTER DUMPSTER SYSTEM



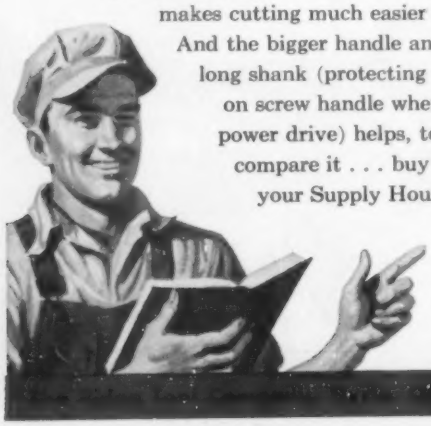
So you get easier quicker action with

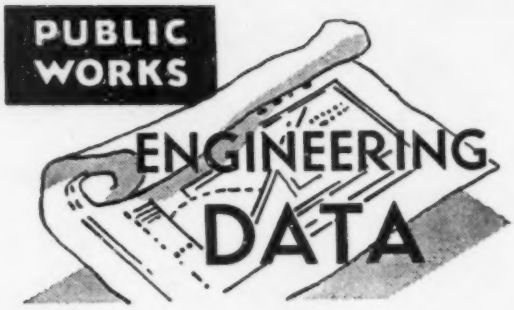
New

RIDGID

Heavy-Duty Pipe Cutters

The instant you start feeding in this new cutter on a pipe you feel the remarkable difference, the new cushioning effect that makes cutting much easier and faster. And the bigger handle and extra long shank (protecting threads on screw handle when you use a power drive) helps, too. Try it, compare it . . . buy it at your Supply House.





Using Digester Gas Saves Thousands of Dollars for Sewage Treatment Plant

Digester or sludge gas has been used at the Gary, Ind., sewage treatment plant since 1941. The daily average value of gas used is $62.69 and over the 16 years, the value has amounted to $366,386. The value of this gas is computed on the basis of existing rate schedules for a large consumer using approximately 5,000,000 cubic feet of gas per month. Since sludge gas contains approximately 600 btu per cubic foot and purchased gas 1000 btu, adjustments have to be made on a heat content basis to determine the value of sludge gas. During the 16-year period sludge gas as a source of power supplied 93 percent of pumpage and 99 percent of aeration requirements. The totals demonstrate the economy in operation it is possible to effect through sludge digestion and utilization of the gas as a source of power.

W. W. Mathews is superintendent of the Gary Sanitary District.

Construction Injury Rates for 1956 Were Lower

Injury rates in the construction industry were lower in 1956 than in any year for which national records are available, according to the U. S. Department of Labor's Bureau of Labor Statistics. For all contract construction combined, the 1956 injury-frequency rate was 31.2 disabling injuries per million employee-hours worked. This was a marked reduction from the 1955 rate of 34.5.

The decline in the over-all frequency rate reflected improvement in three of the four main divisions of contract construction. The rate for general building contractors was down from 39.8 for 1955 to 34.5 in 1956. For highway and street construction the drop was from 37.5 to 34.2; and for special-trade contractors as a group there was a decline from 31.1 to 28.1. In the field of heavy construction, other than highway and street, there was no significant change, 30.9 in 1956 compared with 30.1 in 1955.

Despite the improvement in the injury-frequency rates, the actual volume of disabling injuries in construction rose slightly—from 220,000 in 1955 to 225,000 in 1956, reflecting the 1956 increase in construction employment.

Estimating Population by Residential Light Meter Installations

Based on the number of residential light meters installed, Cuyahoga Falls, O., Geo F. Johnson, City Engineer, has estimated the population of the City. The records go back to 1930 and the population density factor has been computed from meter installation records and census figures. The residence light meters are an accurate accounting of the num-

Four more improvements in the Barber-Greene Finisher

Four new improvements give the Barber-Greene Finisher faster speed, faster travel, lower maintenance cost and increased power.

Improving the Barber-Greene Finisher is not something new. Scores of major improvements have been embodied in its design since it was first released to the field 20 years ago.

These improvements have been incorporated without spectacular announcements or fanfare. They have all been based on vast experience. In fact, the Barber-Greene Finisher is now paving its second million miles, which is many times the mileage and tonnage records of all other asphalt paving machines in the world combined.

These are all proven, sound improvements developed from experiences in laying every type of mix, in virtually all conditions. Machines embodying this group of design changes are now in production and are designated as the Model 879-B.

Latest improvements include:

NEW TRANSMISSION—Provides both higher operating and travel speeds. The new transmission still provides 12 forward speeds giving a wider range of operation.

HIGHER SPEED TAMPER—This new design permits faster laying speeds and reduces maintenance costs.

NEW CRAWLERS—Precision-drilled pads and larger pins will further decrease maintenance costs.

NEW POWER UNIT—20% more power. This means pushing even bigger trucks, handling even steeper grades, greater reserve for high altitude, and higher speeds of operation.

Note To Barber-Greene Finisher Owners

These latest improvements, as well as many previous improvements, can be incorporated in your old machine. Necessary parts are now made up in kit form for each modification separately. A folder describing the various kits is available.

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

Adams Filters installed at the new Delaware pool in the Town of Tonawanda, N. Y., give the water extra polish and beauty . . . a special invitation to enjoy the pleasures of this beautiful pool.

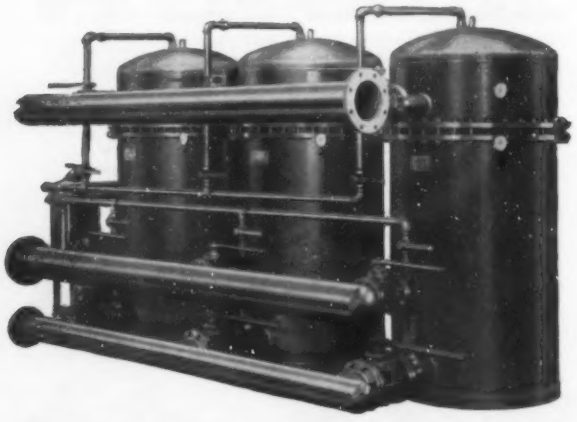
It's easy to keep your pool water Crystal Clear at Lower Costs

Hundreds of swimming pools across the nation have found that Adams filtration packages are the right answer. That's because of the advanced engineering design . . . diatomite filtration . . . permanent Poro-Stone elements . . . compact installation . . . simple operation featuring a new backwash technique.

We have a wide range of filters and delivery is prompt. You'll find the price of crystal clear water for your pool is amazingly low, so write for complete information, today.

ADAMS *SPF*...

TODAY'S FINEST SWIMMING POOL FILTER



Adams SPF filters are ideal for community pools like that illustrated above. This triple SPF 169 can handle pools up to 730,000 gallons capacity.

R. P. ADAMS CO., Inc.

228 East Park Drive, Buffalo 17, N. Y.

ber of family dwelling units in the City as they correctly indicate duplex and multiple apartments as dwelling units.

Forecasting of future population does not lend itself to an exact science and in the endeavor to approximate future trends, there are variable factors which need to be adjusted from time to time. One of these variables is the density factor. The report states:

"We find that the family unit, or density factor, is constantly decreasing, i.e., there are fewer persons per average family at present than in 1930. For example, in 1930 the density factor was 3.936; in 1940, 3.74; and in 1950 3.37. Our population table forecasts the population through 1954 by using the density factor established in 1950 at 3.37.

"Since a graph will show this steady decline in the family unit, it should be more accurate to project this reduction of 0.037 per year for the years 1951, 1952, 1953, 1954 and 1955, ($5 \times 0.037 = .185$) and reduce the factor of 3.37 by this amount. This will give a corrected density factor of ($3.37 - .185 = 3.19$), however, our study indicates that a further reduction of this density factor below the figure of 3.23 will create a more or less static condition of estimated population; therefore, from 1955 to 1960 the figure of 3.23 will be used in computing the estimated population year by year. The Federal Census for 1960 will prove or disprove this method of estimating the population for the City of Cuyahoga Falls. Applying this figure of 3.23 to the number of family units (13,170), we have a corrected estimated population of 42,539 for January 1, 1958."

Reroofing a Water Reservoir

Sheldon Reservoir Unit No. 1, Pasadena, Calif., was reroofed, using galvanized corrugated steel on supports of Douglas fir framing and Redwood columns which is the same as was used for Unit No. 2 constructed in 1939. The new roof covers an area of 64,000 square feet and affords a protective cover for 6,728,700 gallons of water storage. While the reservoir was out of service all cracks in the construction joints were coated with latex asphalt reinforced with fibre glass fabric. It is of interest to note that the original roof was constructed in 1917 using 1-in. by 12-in. sheeting as a covering material at a cost of $4,308. The new reservoir roof of a modern and durable type of construction and designed as an earthquake proof structure, cost $101,000. This tremendous increase in cost is partly because labor and materials have gone up. It illustrates the fact that allowable depreciation does not reflect the amount of money necessary for replacement. From the 1956-57 report of D. A. Blackburn, Chief Engineer & General Manager.

Begins Mutual Aid Radio Service

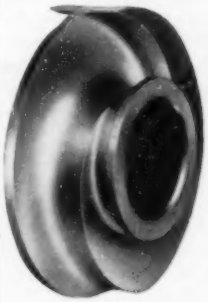
Fire protection services in 32 towns in southwestern New Hampshire will be connected in a dual radio network under a mutual aid communications system. The control center for the southwestern system will be at Keene, New Hampshire. A 150 mc unit will be installed with a repeater station covering the eastern sector of the area and a regular base station covering the western sector. Mobile radio units in the participating communities will be associated with the base station equipment to give broad coverage in emergencies. The new two-way radio system will be part of the recently established tri-state mutual aid communication program, which organizes neighboring communities in Massachusetts, New Hampshire and Vermont in a unified civil defense program.

You'll hear a lot about

MONO-VANE

SINGLE PASSAGE IMPELLER

the New NON-CLOG PUMPS "by Aurora"



PATENT PENDING

AVAILABLE HORIZONTAL or VERTICAL

The BALANCED Impeller may be trimmed — to suit other heads and capacities — yet REQUIRES NO SEPARATE COUNTERBALANCE

●

UNSURPASSED for HANDLING LONG STRINGY SOLIDS

●

EXCELLENT NON-OVERLOADING CHARACTERISTICS

●

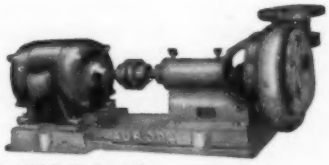
IDEAL FOR ELEVATING SEWAGE — PUMPING SLUDGE — HANDLING SETTLEABLE SOLIDS, EFFLUENT and OTHER WASTES

Aurora's exclusive MONO-VANE IMPELLER represents a major advance in the technique of non-clog pumping. Can be trimmed to various diameters — REQUIRES NO SEPARATE COUNTERBALANCE because it is in dynamic and hydraulic balance — therefore a wide range of operation. Built to Aurora's notable standards of quality for efficiency, long trouble-free service and economy. WRITE FOR BULLETIN 121-MV.

A COMPLETE LINE OF AURORA NON-CLOG PUMPS

— of conventional types are available to meet every situation. We'll gladly send you BULLETIN 121-A.

Aurora Type KU Vertical MONO-VANE Non-Clog Pump



Aurora Type KGG Horizontal MONO-VANE Non-Clog Pump

ENGINEERS

PUMPS "by Aurora" include pumps for every need in industry. Acquaint yourself with this distinguished line by requesting our CONDENSED CATALOG — a guide to the comprehensive line of Aurora centrifugal and turbine-type pumps. Aurora enables you to specify with confidence.

Your Inquiries Will Command Prompt Attention

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY

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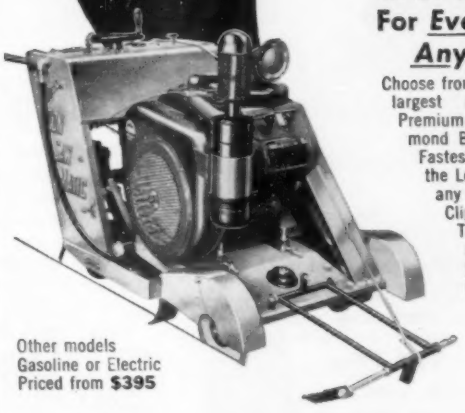

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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Michigan: The Water Wonderland

State Board of Education v. City of Ypsilanti 85 N.W. (2d) 94, a Michigan case decided October 7, 1957, involved a mandamus proceeding by a State College, to require the City of Ypsilanti to permit connection of new college buildings to the City sewerage system without charge.

During the past year or so the Eastern Michigan College at Ypsilanti has had under construction eight new residence apartment buildings, one to be used by the faculty and the others to be used by married students. Plans called for completion and occupancy at the opening of the fall term of school in 1957. These new structures are located on its own property in Ypsilanti township, outside but adjacent to the city limits of Ypsilanti. As the construction sufficiently proceeded the College sought to have these new buildings effectively connected with the City of Ypsilanti water and sewage system and the water turned on, but this the City refused to do unless the College first paid certain so-called "capital improvement charges" totaling $4,800 for tapping its water and sewage system, as provided by certain new ordinances passed by the City on January 21, 1957. The College conceded it had to pay for water and the water connection, and also the water "capital improvement charge," and tendered its $3,000 check for the latter, but refused to pay the $1,800 sewer "capital improvement charge" sought to be imposed by the City, notifying the City that under a valid pre-existing contract between the two it should not and could not be required to pay for any sewerage connection. The City then refused to connect, turn on or furnish water or permit sewer connection.

The College showed a contract with the City, entered into in 1926, which provided among other things that the College was to have the right to connect with the sewer without charge. The City's defense was that its 1957 ordinance required payment of capital improvement charges.

The Michigan Supreme Court granted the mandamus, holding that, "[The] plain intendments of the contract of 1926 between the parties cannot be circumvented by the device of a so-called sewerage capital improvement charge . . . [The] College is not obligated or required to pay the City any such charge nor may it pay any such charge at all."

I'll Take the Low Road

Wessinger v. Goza, 99 S.E. (2d) 395, a South Carolina case decided July 31, 1957, was an action to enjoin the blocking and closing of an old public road after the Highway Department had established a new road and paved it. The plaintiffs were owners and occupiers of land along the old road, which had been in use for more than fifty years.

The new road was "somewhat like the string of a bow and the old road [was] somewhat like the bend of a bow, and the distance from the old road to the new road varies from zero to something over 100 feet in its widest area." The State Highway Dept. or the County Board of Commissioners blockaded the old road, so that the only method of egress the plaintiffs had was to go to one of the roads leading some distance from their property, and then go down the new road and come back across the entrances from the new road to the old road.

The court granted the injunction. "Once a highway always a highway", the court said—unless it is *abandoned*. "It is axiomatic that a public highway is not abandoned simply because a new highway is built . . . [As] long as the various adjoining property owners do not

Reflective Pavement Marking . . . what to look for when you buy it

As an engineer, you quite naturally want quality of performance in the pavement marking material you lay down. Yet performance alone cannot be the sole yardstick in evaluating quality because of the cost factor involved. The final selection or recommendation you make, then, actually becomes the result of evaluating all facets of performance in the light of dollar value received.

To help you in this important evaluation, here are a few facts about reflective pavement markings in general, and one product in particular, pre-mixed, "Centerlite" Reflective Compound.

Modern striping unit in Milwaukee, Wisconsin, shows quick, easy one-step application of "Centerlite" Reflective Compound. Reflective beads are pre-mixed in striping compound. Rugged film holds beads in tight grip. Beads give a hard, long-wearing surface to resist traffic wear. You get durability in both reflectivity and in the stripe. You get what you want—performance and economy.

Pre-Mix Durability

Of the two basic types of reflective marking materials, the pre-mix type (where reflective elements are mixed in the compound by the manufacturer) gives you a primary advantage of greater durability. In fact, "Centerlite" Reflective Compound has repeatedly demonstrated its superiority in this department by lasting up to three times longer in actual on-the-pavement tests than other types of reflective markings.

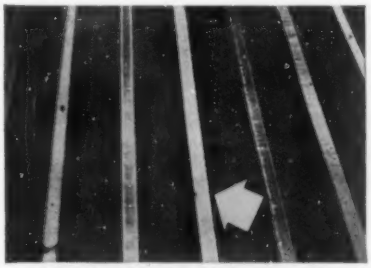
Why the longer life? Because the reflective beads are distributed uniformly throughout the stripe and held in the grip of a rugged film. The characteristics of this film are such that the tightly gripped beads don't flick out easily. Traffic wear is minimized because the film guards and holds the beads in place, and the beads, in turn, provide you with a hard, long-wearing surface.

This durable double-action is an exclusive of pre-mixed striping. Any other reflective stripe type soon loses surface beads to traffic wear, lessening resistance to abrasion and also diminishing its reflective quality as time and traffic pass. The point of durability is a primary advantage of the pre-mix material because it helps give you a *lower* cost per foot per day of useful life. It is certainly one of the things to look for when you buy.

One-step Application Ease

Another significant advantage of pre-mix striping is in application. With "Centerlite" Compound, you have only one item to order, to store, to handle. And because the beads are already in the mixture, you apply the stripe in one fast pass. Humid or windy days pose no problems. The stripe dries quickly . . . and you have reflectivity over every inch of marking, whether on flat or super-elevated planes.

This application ease, too, contributes to lower cost per foot per day of useful life. "Centerlite" Compound can also be easily applied by almost every striper. No settling in the tank, no extra gun wear, no gun clogging.



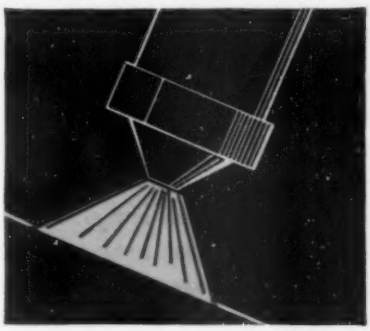
All lines applied on same day. Photo taken after 8-month test proves performance of "Centerlite" Reflective Compound (arrow).

Lifetime Reflectivity

From the safety standpoint, pre-mixed "Centerlite" Compound gives you advantages in lasting brightness that other types of reflective markings can't match.

The reason for this, again, is the fact that the reflective beads are all through the striping compound. So, when your line is laid down, wherever there is paint, there is reflectivity. No chance for spotty, unreflective areas.

As the stripe wears, and they all do, new beads in pre-mixed "Centerlite" Compound are constantly exposed. Reflectivity *lasts the full life of the stripe.* You get, combined with the *lower* cost per foot per day of useful life, the *highest* performance factor. And this is the combination that means you get the performance you look for and the economy you demand.



New "Centerlite" Compound gives you easy, one-step application. Pre-mixed reflectivity stays uniform even on superelevated sections.

Your 3M Distributor or Representative will be happy to supply you with more facts as well as with "Centerlite" Compound itself. Or write to the 3M Company, Dept. QV-28, St. Paul 6, Minnesota.

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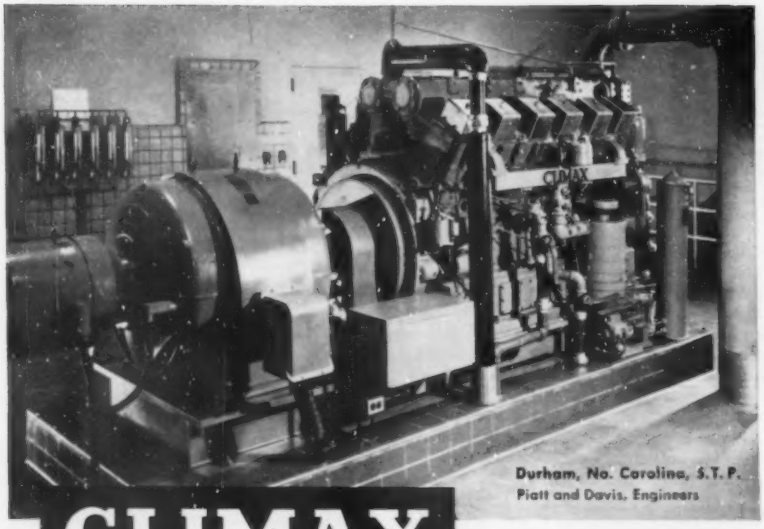

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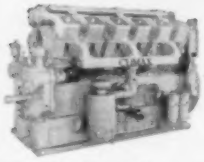
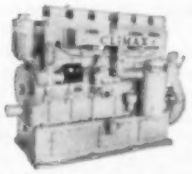


V-125—12 cylinder, 605 max. H.P. at 1200 R. P. M.

V-122—12 cylinder, 520 max. H.P. at 1200 R. P. M.

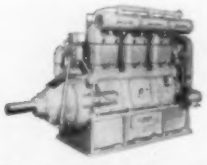
V-85—8 cylinder, 390 max. H.P. at 1200 R. P. M.

V-80—8 cylinder, 340 max. H.P. at 1200 R. P. M.



K-75—6 cylinder, 302 max. H.P. at 1200 R. P. M.

K-67—6 cylinder, 265 max. H.P. at 1200 R. P. M.



R-165—6 cylinder, 192 max. H.P. at 1200 R. P. M.

R-110—4 cylinder, 130 max. H.P. at 1200 R. P. M.

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agree then the existing road or highway must remain open and must be maintained by the proper authority for use of such owners".

Elmhurst's Sidewalks

Arvidson v. City of Elmhurst, 145 N.E. (2d) 105, an Illinois case decided Sept. 20, 1957, was an action by a pedestrian against a City for injuries sustained in a fall on an allegedly defective sidewalk.

The difference in level between the adjoining slabs of sidewalk on which the plaintiff fell was about two inches. The lower level slab slanted toward the street, and the difference in level progressively increased in the direction toward the street. Neither plaintiff nor the City was actually aware of this sidewalk condition, although it had existed for over a year.

The plaintiff obtained a jury verdict of $9000. The Appellate Court of Illinois reversed this judgment, on the ground that the City was, as a matter of law, not negligent. Finally, the Supreme Court of Illinois upheld the original jury verdict, on the ground that a condition such as described cannot, as a matter of law, be said to constitute negligence or the absence of negligence, and that it was a proper question for the jury to have decided.

Fine for Parking

People are always fighting over money, and the people of Dearborn, Michigan, are no exception. Thus, in *Thomson v. City of Dearborn*, 347 Mich. 365 79 N.W. (2d) 841, decided May 17, 1957, a taxpayer brought a suit against the City of Dearborn to test the validity of a provision in an ordinance that fines for parking meter violations be credited to a special fund for the benefit of the holders of revenue bonds.

The revenue bonds had originally been issued in connection with a municipal parking system, in connection with which the meters had been installed. According to the plaintiff tax payer, the bonds could be paid off only with the *revenue* from the parking meters, i.e. the money collected in the meters, but not from *fines* for parking meter violations.

The Supreme Court of Michigan agreed that fines for violation of ordinances must be paid into the *general* fund, and cannot be diverted to any special fund, even though related in this way to the fines. A fine imposed on one convicted of such a violation is not in any proper sense of the term a charge or fee for service rendered.

This Pocatello, Idaho, storm sewer in good condition after 44 years

In 1914, Pocatello, Idaho, installed this 36-inch-diameter Armco Corrugated Metal Pipe as a storm sewer. A 1957 inspection of this pipe revealed practically no corrosion, no erosion. The sewer is good for many more years of service.

LOW COST THROUGH LONG LIFE

Armco Corrugated Metal Structures have been used as storm and sanitary sewers throughout the country for the past half-century. Many of these are still giving good service today. This durability, coupled with low maintenance costs, assures long-term savings with Armco Corrugated Metal Structures.

Over the years since the Pocatello sewer line was installed, Armco's continuing research program has developed even more durable products to meet severe corrosive and erosive conditions. For information on the newest of these improved products—Armco SMOOTH-FLO® Sewer Pipe—just fill in and mail the coupon.

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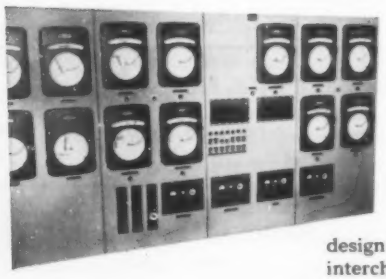

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Request Bulletin 240-P2A . . . and see how your system, can be controlled (interference-free) over a single circuit. See how the compact, "plug-in" design of the power supply, transmitter, and receiver units offer ease of assembly, interchangeability, installation, and system expansion. Write **Builders-Providence, Inc., 356 Harris Avenue, Providence 1, Rhode Island.**

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Bermico, the tough cellulose fibre pipe, for house-to-septic tank or sewer connections, is thoroughly impregnated with *coal tar pitch.*

It exceeds Federal Government performance requirements for Water Absorption—Crushing Strength—Chemical and Kerosene Resistance—Hot Water Resistance—Heat Resistance—Resistance to Flattening—Beam Strength.

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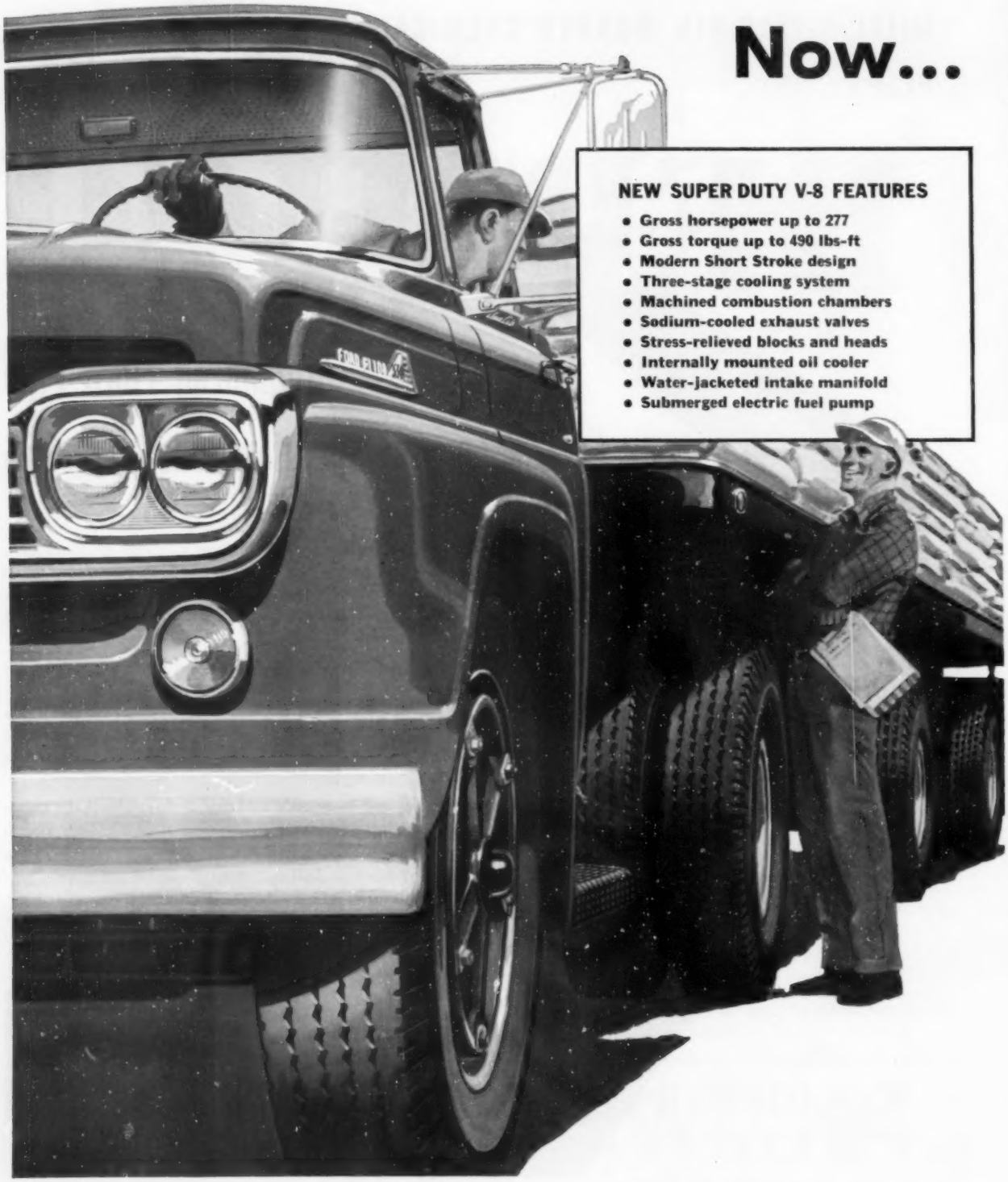

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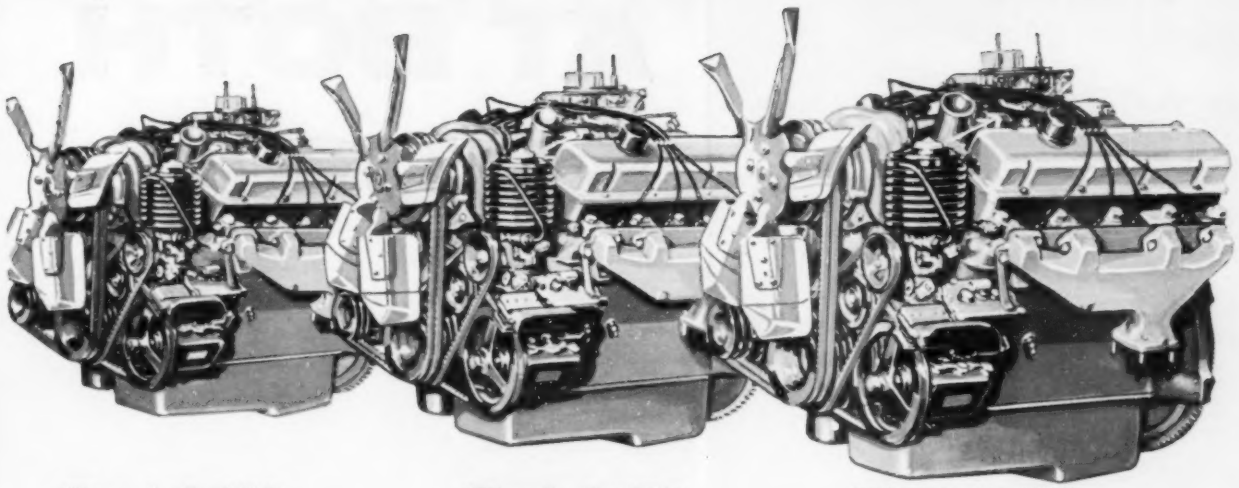
super duty V-8's up to 534 cu. inches!



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Maximum horsepower—226.
Torque: 350 lbs-ft @ 1800 to 2300 rpm.

477-cu. in. Ford V-8
Maximum horsepower—260.
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534-cu. in. Ford V-8
Maximum horsepower—277.
Torque: 490 lbs-ft @ 1800 to 2300 rpm.

10 BIG NEW EXTRA-HEAVY TRUCK SERIES

GVW's up to 51,000 lb. For '58, ten new basic series are added to Ford's already extensive Heavy and Extra Heavy Duty line. Four new Tilt Cabs, four new Conventionals, and two new Tandem models offer GVW ratings up to 51,000 lb.

GCW's up to 75,000 lb. New T-950 Tandem is rated for 75,000-lb. GCW. Biggest single-rear-axle models are rated for 65,000-lb. GCW.

Front-axle capacities up to 15,000 lb. Choice of three front axles in most new Ford Extra Heavies. Rated capacities of 9,000, 11,000 and 15,000 lb.

Rear-axle capacities up to 29,000 lb. Wide choice of rear axles includes single-speed and two-speed, single reduction and double reduction types. Capacities range from 18,000 lb. to 29,000 lb.

Bogie-axle capacities up to 38,000 lb. For '58 there are *five* Ford basic tandem axle models. Biggest of the *five* is the brand-new T-950 which features a tandem rear-axle assembly rated for 38,000 lb. Other bogie-axle capacities range down to 22,000 lb. for Ford Series T-700.

New transmissions. Roadranger transmission available in all ten new Ford Heavies. Up to 33% less shifting. Engines operate in peak horsepower range, use less fuel. "Short Fourth" transmissions also available on "F" and "C" Series.

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Look at
Highland Park's No. 977...

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The sanitary landfill area in the Borough of Highland Park, N. J., covers about 20 acres and a lot of it is shale. It used to take air hammers to loosen the shale for trenching. This meant time and extra money. Today a Caterpillar No. 977 Traxcavator* simply pulls a CAT* No. 6 Ripper through the shale, making it possible for the Traxcavator to build the trench quickly and inexpensively. Then the No. 977 dumps and compacts the garbage in the trench. On this job the No. 977 is replacing a tractor and at last reports was handling what was formerly eight hours' work in one.

The No. 977 is one of three Cat-built Traxcavators with bucket capacities from 1 to 2¼ cu. yd. You saw how versatile the Traxcavator is with a ripper attached, but only an actual demonstration on your own project can show you the amazing versatility of this machine. Ask your Caterpillar Dealer especially about the brand-new side dump bucket which only the Traxcavator offers. Note this, too: all Traxcavator models are available with a heavy-duty undercarriage for those tougher jobs that put extra strain on your equipment. But get the whole story firsthand right now. A Traxcavator can save you tax dollars—pick up your phone, call your Caterpillar Dealer and find out how.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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YOUR TAXPAYERS GET THEIR MONEY'S WORTH WITH CAT-BUILT MACHINES

Vol. 89, No. 2 FEBRUARY, 1958

PUBLIC WORKS MAGAZINE

EXPRESSWAY COMPLETION to Bring Economic Growth

DON WAGECK,
City Manager, Montrose, Colo., formerly Administrative Ass't., Austin, Texas

PORTIONS of the Canada to South America highway, U. S. Highway 81, are complete and the Federal Government and various state highway departments are rapidly planning and constructing other portions. There are now some 8.6 miles of this highway completed within the City limits of Austin and only a one-mile section in the downtown area remains to be constructed.

To Austin and its inhabitants this new highway means many things. It means, initially, further economic growth to the region in and around Austin; it means greater ease of travel; and it guarantees continued development of the section's tourist attractions.

The history of this expressway through Austin goes back to World War II when there was much talk about such possibilities. In May, 1946, the citizens voted the first of two bond issues for buying right-of-way for the project. Fortunately, the founders of Austin had provided a 200-ft. street bounding the east side of the old City and this course was followed as far as it went, thus saving the City many hundreds of thousands of dollars in right-of-way costs. Actual cost to the City for right-of-way for the project ran a little over $2,000,000. The City was also responsible for adjustment of water, electric (municipally-owned), and sanitary sewer utilities required by the new roadway. These adjustments were financed from current funds as the work progressed. Adjustments necessary for the telephone and gas company were paid for by those utilities.

Only the one-mile section in downtown Austin remained to be constructed when the new Highway bill was passed providing for 90 percent Federal participation on the Interstate System. At the same time, the citizens of Austin were voting a $1,300,000 bond issue to finance the right-of-way needed for the consummation of this project. This authorization may now be used on other highway right-of-way acquisition since the Federal and

● EXPRESSWAY brings motorists into Austin quickly but bypasses the heart of the city to avoid local traffic.

● **INTERNATIONAL highway looking north as it leaves Austin. Lighting units are mercury vapor, 400-watt. Three miles are now lighted; all will be eventually.**

State government will finance the entire cost of the remainder of the Highway within the City limits of Austin.

The uncompleted portion of the expressway—approximately 1.1 miles—in the center of Austin is in the final planning stages. Approval has been given by the Federal Bureau of Roads to Texas Highway Department plans, and actual construction should begin on this section early in 1959. Additional right-of-way now being purchased along this section will provide for a six-lane expressway, sometimes depressed, sometimes elevated as well as the conventional frontage-roads. Estimates now place the cost of this section at approximately $1,500,000 for right-of-way and $3,900,000 for construction—a total of $5,400,000.

As now planned, the construction of this central section will involve some modification of existing streets and traffic patterns, but will not create any foreseeable financial problems for the City. The utilization of an elevated expressway through a seven-block stretch of the center portion of the section saves the City close to $500,000 that would have been required for utility relocations had the roadway been depressed.

Completion of a major portion of the Highway has led to the quick development of the northeast section of the City and more than one developer in the area has advertised widely "5 minutes drive to downtown Austin" as one of the major selling points favoring his new subdivision. The 24-hour count is over 26,000 vehicles now at one point on the Expressway—some 20 percent more than any other street in the City carries.

Lighting of Expressway

Provisions have been made for lighting the entire expressway project with lights on about three miles of the highway already installed and operating. The lighting units consist of ornamental light standards with mercury vapor 400-watt lamps and units are planned for all sections of the expressway and at major intersections. The lighting system has been constructed and financed on a 50-50 basis between the Texas Highway Department and the City. Maintenance and other operational costs are also shared equally by the sponsoring agencies.

The construction of this major traffic thoroughfare in the City of Austin has not involved major removal of dwellings and other structures as has been the case in many other cities of comparable size. The route followed an established 200-ft. right-of-way through the developed section of the city and thus required very little displacement of dwelling units and business establishments. The section now being planned passes through the east of the downtown business area and, being wider, will result in a higher incidence of removal and relocation of dwellings and commercial houses. It might be noted that there should be no added burden on housing in the city as relocated families will be eligible for Section 221 (Relocation Housing) of the National Housing Act.

Fluent traffic flow on the Expressway is provided by traffic interchanges, and of course, no crossings are made at grade. Control of traffic onto and off the expressway is accomplished by the use of 'Yield Right-of-Way' signs. Many of the streets crossing the Expressway had already been designated thoroughfares; others are now collector streets. Widening of these streets had been foreseen when plans for the highway were first proposed by the State Highway Department during World War II.

Paving standards which have been carried out in the crosstown thoroughfares consist of 10-in. flexible or stabilized base and 2-in. asphaltic concrete pavement. Financing the cross-street paving is accomplished through property owner participation with the City paying approximately 20 percent of the total cost of the paving, exclusive of curb and gutter.

Paving of cross-streets is now progressing rapidly, thanks to a $4,000,000 bond issue approved by the voters in May 1956. The expressway has led to changes in patterns of traffic flow and as a result has required advancement of development of thoroughfare plans in several areas.

● **EXPRESSWAY at intersection with recently completed northside crosstown artery. There are no crossings at grade and "Yield" signs control on and off traffic.**

COUNTY COURT HOUSE

Speeds Copy Work

A 60 PERCENT time saving in certain clerical tasks, increased service to taxpayers at less cost, and a higher degree of general office efficiency are three major results following the installation of two office copying machines at the Dakota County, Minnesota, court house.

While the machines are located in the offices of the county auditor and the county sheriff, personnel from the majority of offices of other county officials in the building make valuable use of the machines. Major uses for the machines include copies of reports of county commissioners; copies of metes and bounds descriptions; letters concerning property evaluations; sketches and plats of property when transfers are made; and general correspondence. The two machines in use by Dakota County are "Thermo-Fax" copying products made by Minnesota Mining and Manufacturing Co.

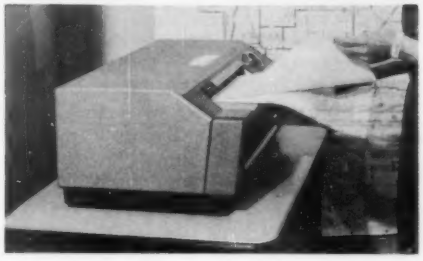
A major use for the machine by county auditor, Norbert G. Yanz, is the copying of the county commissioner's records. Previously, eleven copies of every meeting had to be prepared for distribution to commissioners, other county officials and the three newspapers located in Dakota County. Since a minimum of six legible copies of a single page could be made by typing with carbon paper, office personnel had to type the report twice to obtain the necessary eleven copies. Commissioners meet two or three times a month, and reports average five legal size pages requiring excessive manual duplication.

Now, with 60 percent less effort, an original report is typed and 10 copies made on the copying machine at weekly time savings of two to three hours. A second time saving is reflected in the elimination of proofreading the second set of reports since exact and error-free copies are ready for immediate distribution.

Metes and Bounds Descriptions

Another use by the auditor's staff is copying metes and bounds descriptions—lengthy legal writeups of property involved when a deed is transferred. Formerly a taxpayer would wait at the court house while a copy of his property description was typed out by the staff—a time consuming procedure for both staff and taxpayer since descriptions had to be carefully proofread. Interruptions such as this also caused irregular work schedules for office personnel.

● **COUNTY auditor N. G. Yanz and Assessor A. L. Mallery look over some of the reports copied by the Model "Fourteen" machine.**



● **COPIES of long and detailed reports of the auditor come out of the machine errorless and dry, ready for use or for filing.**

Descriptions are now copied immediately on the copying machine and returned to the taxpayer allowing office personnel to prepare a new description at more convenient times. Taxpayers, who would ordinarily have to wait as long as 20 minutes for a new copy to be typed, can now leave with the original in a few seconds.

Property Evaluation

A. L. Mallery, County Assessor, who uses Mr. Yanz's machine, finds it to be of aid in answering complicated letters dealing with property evaluations.

Such queries are answered more quickly by making a short reply at the bottom of the original, filing a copy and returning the original and notation to the sender. This procedure eliminates the possibility of error and allows the sender to review his original request along with the reply.

"We also use the machine for copying tax report summaries, financial statements, and sketches or drawings of property which are difficult to reproduce correctly by hand," Mr. Mallery reports. "Since the machine makes errorless copies, we don't have to proofread the long columns of figures, or worry about a costly error in copying a drawing," he says.

The second copying machine is used by Sheriff C. L. Cherry, and his staff to make copies of arrest warrants, duplicates of reports which go to patrol cars and copies of civil court proceedings—all at considerable time savings.

Auditor Yanz's office is equipped with a "Fourteen" copying machine which accommodates documents up to 14 ins. in width and any length, while Sheriff Cherry uses a "Secretary" copying machine. Both machines produce completely dry copies in four seconds by electricity. No operator training is necessary to operate "Thermo-Fax" machines and no chemicals, fluids or negatives are necessary.

SIGNAL SYSTEM

DESIGNED FOR DOWNTOWN TRAFFIC

R. T. GREGORY
Director of Planning and Traffic
Waco, Texas

DESIGN STUDIES on a new traffic signal system were started early in 1956, by Waco, Tex. The existing system consisted of 29 intersections operated by one controller by means of cascade relays, and five non-interconnected signals placed at random throughout the system. In addition, four new signals were needed at intersections not previously signalized.

In designing a new signal system three goals were set as minimum standards to be met: (1) It must handle the heavy loads of today; (2) it must be capable of handling future traffic to the limits of the physical capacity of the street system; and (3) it must provide protection for pedestrians. Design was completed and work started on the new system in the summer of 1956, and all signals were completed and in operation by the first week in May, 1957.

Waco is situated on the banks of the Brazos River, with about three-fourths of the population and nine-tenths of the automobiles on the west side of the river. Since most traffic problems occur during the peak periods when people go to and from work, our problem is one of getting people back and forth from the central business district to the west part of town, mostly along north and west arteries.

A necessary preliminary to proper operation of the signal system was one-way streets in the downtown area. This, completed in late 1956, converted two of the three east-west arteries to one-way operation in alternate directions with the two-way street in the middle. All north-south arteries were converted to one-way operation with one pair extending entirely across the City.

To handle the traffic movements, a traffic actuated system was chosen. This is the PR system manufactured by Automatic Signal Company, modified for special pedestrian movements. The cycle length and offset of the signals are controlled by detectors placed at three locations: At the edge of the system on Franklin Avenue, the inbound (eastbound) artery; in the center of the system on Washington Avenue, the outbound (westbound) artery; and in the heart of the shopping area on Austin Avenue, the only two-way east-west street. Thus two of the detector locations are on one-way streets and the third, in the heart of the district, is on the only two-way street.

● SIGNAL and sign arrangement in this picture are typical.

These locations were chosen as sampling points because the traffic counts taken here are considered representative of the volumes and movement of traffic within the system. The detectors (all of them pressure type) placed at these locations are connected to computers which

● FIRST part of green period: Pedestrians and vehicles move across intersection in parallel lines.

● LAST part of green period: Pedestrians have "don't walk" signal; vehicles move around corner.

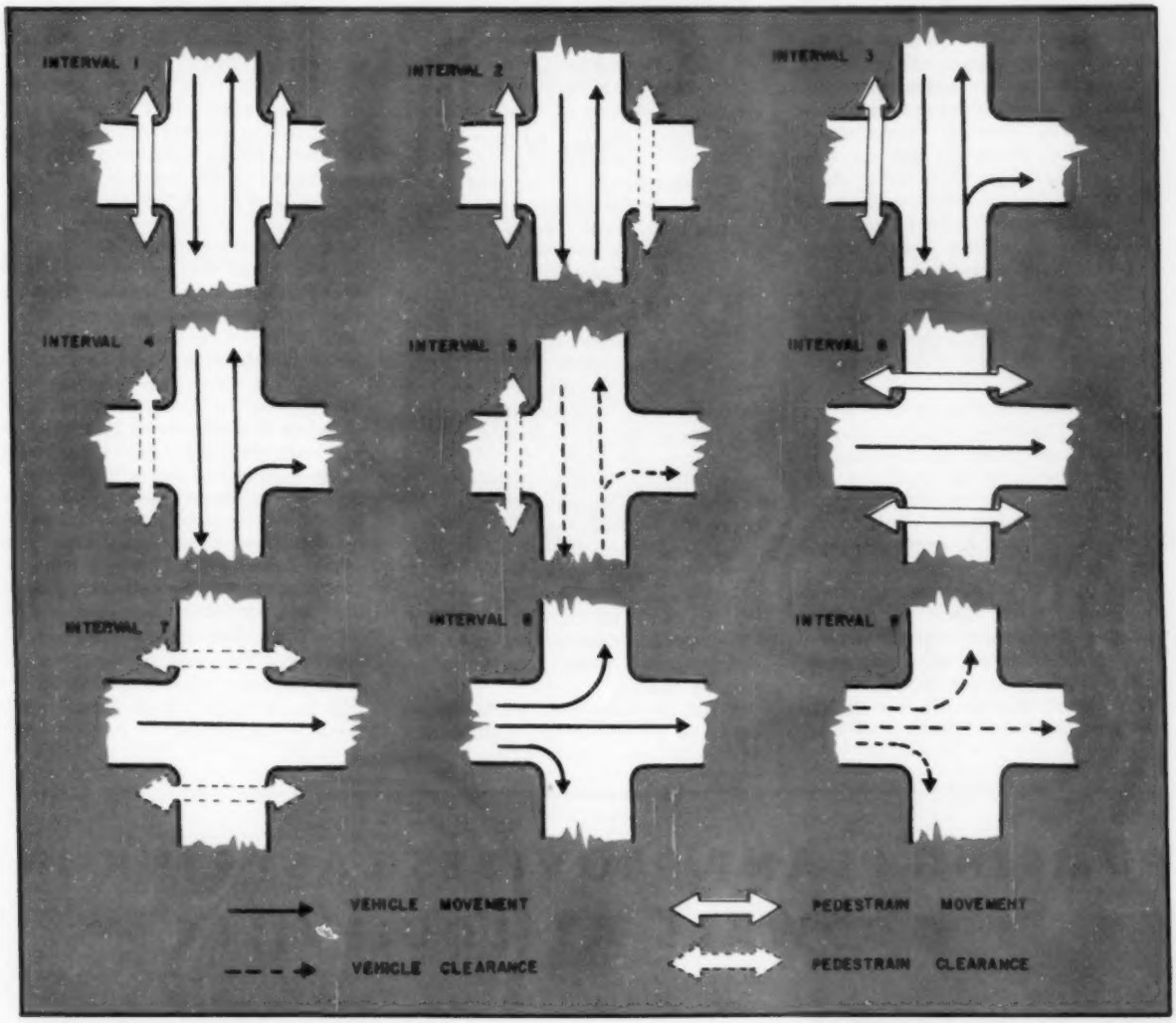
perpetually count traffic and convert the counts into vehicles per hour per lane, based on a four-minute average. Thus, at each instant the past four minutes of traffic counting is totalled and these running totals are used to govern the operation of the system.

Six different cycle lengths are possible with the equipment used, designated as cycle lengths A, B, C, D, E and F. For our purposes we assigned 55 seconds to cycle length A and 80 seconds to cycle length F, with the intermediate cycle lengths graduated in steps of 5 seconds. The cycle length in operation depends on the density of traffic as indicated by the sampling computers. Since there are three stations with three computers, the longest cycle length called for, representing the highest volume of traffic, governs the system cycle length. Obviously, the computer calling for the longest cycle length will change as traffic conditions change: The computer connected to the sampling station on the inbound artery (Franklin Avenue), called the inbound computer, generally calls for the longest cycle length during the morning peak; the outbound computer (Washington Avenue) takes over during the afternoon peak; and the circulating computer (on Austin Avenue) most frequently calls for the longest cycle length during the off-peak periods.

Austin Avenue was chosen as the third sampling location because most of the traffic circulating within the City, neither inbound nor outbound, sooner or later passes this point. Since Austin is a two-way street, it is not used to a great extent for through or distance travel. Thus all situations of traffic are covered by sampling devices: the inbound, the outbound, and circulating traffic. These are the three situations intended to be handled by the three offsets—inbound, outbound and average.

The system cycle length is always in proportion to the highest traffic volume within the system, regardless of where that volume occurs. The offset is also chosen by the predominant direction of traffic, that is, the direction of travel of the highest volume. This is accomplished very simply:

Since two of the computers are connected to sampling stations on one-way streets, their counts are all directional. Thus, if the inbound computer indicates a much higher volume of traffic than the outbound computer, most of the traffic in the system is inbound and an inbound



● **VEHICLE and pedestrian movements. Control is traffic actuated with modification for special pedestrian movements.**

offset is called for. The reverse is true if the outbound computer is calling for a much higher cycle length due to a greater volume than the inbound computer. If these two computers indicate approximately the same volumes of traffic, then an average offset is called for. The circulating computer sampling traffic on Austin Avenue has no effect on offset since this traffic is not directional in nature and thus requires no favoritism in offset.

Because Austin Avenue is the only two-way street, the different offsets are most noticeable here. There is a variation on the one-way streets, however. Directionally preferential offsets on the one-way arteries are faster than the average offset because a preferential offset is generally called for only when traffic is very heavy, which means a very long cycle length is in operation. Since speed is slower at longer cycle lengths, the preferential offsets are designed to increase the offset speed in the direction of heaviest traffic.

The circulating computer may, however, call for a simultaneous offset. This occurs only when the traffic volume in the heart of the system calls for cycle length F, the longest cycle length. This occurs only when there is so much traffic that directional offsets cause intersections to become plugged, that is, when each block is full of bumper-to-bumper traffic. When this condition exists, all traffic must move or none moves. Since a one-way street has a heavier traffic carrying capacity than a two-way street, this condition will occur first on Austin Avenue, and therefore only the Austin Avenue computer need be concerned.

One other feature of this signal system deserves some explanation. It was felt that turning movements interfered with pedestrian traffic on a crosswalk; and also the pedestrians in the crosswalk interfered with turning movements. The Denver system using the all-red pedestrian interval was considered but rejected because Waco street widths of 45 to 55 feet would require too much time for a pedestrian to walk diagonally across an intersection.

The "Waco Walk"

The system chosen to handle this situation is the semi-exclusive pedestrian interval, known around these parts as the Waco interval; or, more popularly, the Waco Walk. This system allows the pedestrians to walk in the same direction as traffic during the first part of the green period, during which time only traffic travelling straight through the intersection may move; all turning traffic is stopped. The pedestrians are then given a suitable clearance interval, after which turning traffic is allowed to move. Since turning vehicles do not have to nudge pedestrians out of the way to get through the crosswalk, more vehicles can get around the corner. By the same token, the pedestrian has a safer journey across the street since he doesn't have to dodge turning traffic.

It will be noted that, while crossing a one-way street, pedestrians crossing on the up-stream side of the one-way street need never be concerned with turning vehicles since this would require the turn to be into the wrong direction of a one-way street. These pedestrians, therefore, gain a much longer walk period than do those on the other side of the intersection, who must be cleared to allow time for turns to move. This is not true when crossing a two-way street since vehicles can turn in either direction, requiring both crosswalks to be cleared of pedestrians.

Since this type of movement is of value only when there is an appreciable number of pedestrians to cross, it is used only at ten intersections in the heart of the business district where there are enough pedestrians to become a problem; and at these intersections it is used only between the hours of 7:00 am and 7:00 pm on weekdays and Saturdays, with a 2-hour extension until 9:00 pm on Thursdays (shopping night in Waco) and Saturdays.

The time limits are accomplished by use of a time clock which switches the additional intervals in and out—the only use of a time clock required in the entire system. All other changes in operation are controlled by traffic itself as seen by the three sampling stations. It would be most desirable to have a sampling device that would indicate the volumes of pedestrians to be coped with, but this is only one of the many horizons to be crossed in the constant effort to handle more and more traffic with better and better signalization.

PUMPING PLANT PROVIDES LAST LINK IN FLOODWALL AT LOUISVILLE

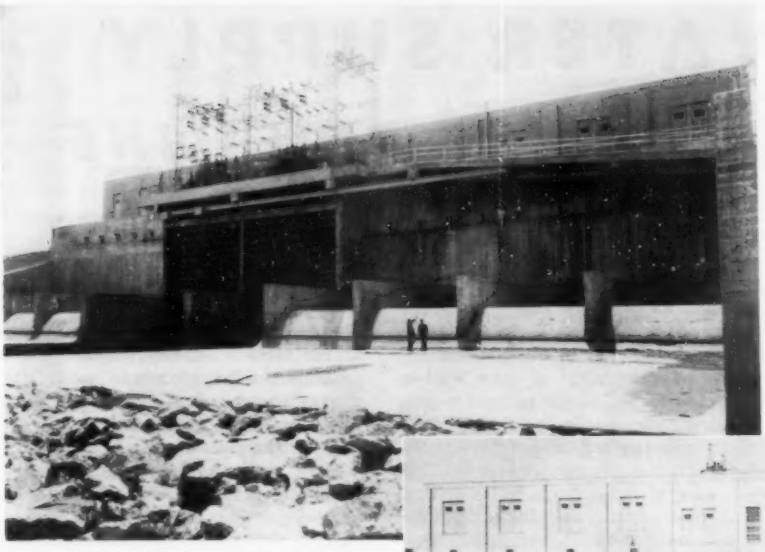
H. J. MEEKER

Worthington Corporation

ONCE threatened with total destruction by the flood waters of the Ohio River, Louisville will be fully protected with the completion of the $5 million Beargrass Creek Pumping Plant, which is the final link in a protective chain of earth and concrete levees. This pumping plant is the last unit of the $26.7 million project begun over nine years ago—a system including 13 pumping plants, 12.8 miles of earth levee, and 4.5 miles of concrete wall. The extensive network of defense has been built to prevent recurrence of the disastrous flood of 1937 when 92 square miles of land in the Louisville area were inundated, resulting in property damage of about $100 million.

Built under the supervision of the Corps of Engineers through a Congressional appropriation, each plant has been turned over to the City and County for operation and maintenance, as is the case for the entire levee system. Government inspectors make periodic checks to assure that the flood walls and plants are kept in safe condition ready for immediate operation, and that all requirements of national defense are met.

The plant, which straddles Beargrass Creek near Mellwood Avenue, is a combination dam and pumping plant. It is divided into three sections, designated as the east, center and west monoliths. In normal times, the creek flows through the center section of the 265-ft. long building through two 33-ft. channels and out into the river. When crests occur in the Ohio, however, gates on the river side of the station close, keeping out the flooding



● **PUMPS installed in Beargrass Creek have a capacity of 2,970,000 GPM.**

stream so that it cannot back up in the creek.

Since the Beargrass Creek drains more than 54 square miles of land, this preventive action is extremely important. The creek waters, having lost their natural egress into the Ohio River because of the dam, spill into two collection chambers located on either side of the creek in the east and west monoliths. It is from these collection chambers that eight pumps draw the water at a rate of almost 3,000,000 gpm, moving it over the levee and dam into the contained channel of the Ohio River. (At this rate, the station's pumps could supply 50 percent of the entire water consumption needs of the United States.)

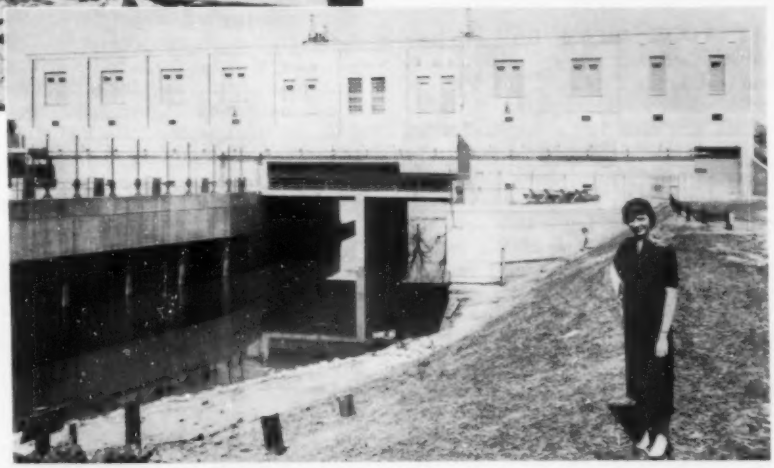
The station houses eight pumps, seven of which are 180-in. Worthington vertical Hiflo pumps, fitted with Mixed-Flo type impellers. Of these, six are powered by 3,000-hp synchronous motors and are capable of pumping 960 cfs each, while the other 180-in. unit has a 2,500-hp motor to provide a capacity of 600 cfs. The operating head range varies from 8 to 33 ft. In addition a 60-in. pump is available, equipped with a 600-hp motor, and having a capacity of 100 cfs.

Two of the larger pumps are in the west monolith; the east monolith contains the remaining four. The two smaller pumps with suction bells at staggered levels are used in the west monolith for manual operation at low flows. As the volume of the creek flow increases, the other side of the plant may open its collection chamber, with additional pumps being brought into operation to remove the rising waters. The larger pumps, with suction bells 13 feet in diameter, lift the water from the chambers into the large siphons, using the siphon action to carry the mass of water into the river with a minimum of power at a low head. After the high waters have subsided, small sump pumps are used to empty completely the collection chambers. The station gates are again opened, allowing the creek to flow naturally.

Siphons Lower Operating Costs

The use of the large concrete siphons at this pumping plant is a very practical method of lowering operating costs. Once the pumps have filled the siphons and started the flow, that flow will continue without the benefit of a mechanical power source until the level of both bodies is identical. In the design of these units care was taken so that an accumulation of air will not break the siphon and stop the flow. An air valve in the plant for regulation of the siphons prevents the water from backing up through them into the creek when the pumps are stopped and the level of the two bodies are nearing each other.

The center portion, through which the creek passes in normal times, is topped by a room housing the electrical switchgear and substation for providing power and control to the pumps. A large heating unit is also installed for heating and drying the plant.



● **FLOW-through channel has gates to block river inflow during high water periods.**

Through the use of the divided structure, either half may be isolated and the other used for pumping purposes. This simplifies operation during light rainfall, and also permits one side to be in operation while repairs are being made on the other.

● **ONE of the eight Worthington vertical Hiflo pumps with Mixed-Flo impellers installed at the Beargrass station.**

NEW WATER SUPPLY
REQUIRES 30-MILE PIPE LINE

THEODORE B. JENSON,

Gee and Jenson,
Consulting Engineers,
West Palm Beach, Fla.

IT TOOK 241,000 feet of pre-stressed concrete cylinder pipe to do it, but the City of Cocoa, Florida, and nearby Government installations, are now being supplied from a new water system. Since the establishment of the Guided Missile Training Center on the ocean beach east of Cocoa a few years ago, the area has become one of the fastest growing on the Florida east coast.

The unprecedented growth of population due to the many firms establishing offices in the area, brought problems. One of the biggest was the existing water supply, which was inadequate both in quality and in quantity. Recognizing the problem, the United States Government, in cooperation with local interests in the area, has set in motion the machinery to correct the inadequacy. In 18 months, engineering studies were made by our consulting firm of Gee and Jenson, reports written, contracts let and the construction project all but completed. The speed with which this has been accomplished is amazing.

Since the existing water system was both inadequate in quantity and undesirable in quality, the immediate problem confronting the engineers was the location of a suitable source of water supply. The proposed system was to supply not only Cocoa, and surrounding areas, but also Patrick Air Force Base, existing and proposed developments on Merritt Island and the city of Rockledge.

Well Sites Tested

A search was instituted in 1955 for suitable well locations. Several wells were drilled west of Cocoa and tested by the U. S. Geological survey under a cooperative agreement with local interests and the state of Florida. These early tests divulged that a suitable water supply could not be obtained east of the St. Johns River. Accordingly, several test wells were constructed some 30 miles west of the city limits of Cocoa. These seemed satisfactory, so sites were acquired, and the well drilling program was started in June, 1956.

The average yield of each well is expected to be 750,000 gallons a day, requiring nine wells to yield a sufficient quantity of water to supply the immediate future demands. The plan provided for wells to be drilled at 2,000-foot intervals for a distance of approximately 3½ miles.

Water treating facilities including aeration, chlorination and fluoridation are included, as well as storage facilities and a pumping station to provide adequate distribution system pressure throughout the Cocoa area. These facilities are all located in the vicinity of the well field.

A 36-in. pre-stressed reinforced concrete water main connects the pumping station and the existing distribution systems of the municipalities of Cocoa and Rockledge, the government installations at Patrick AFB and the missile proving ground at Canaveral. The main extends from the pumping station to the ocean at the east end of the causeway connecting Cocoa and Cocoa Ocean Beach. A 24-in. main extends north and south parallel to the ocean to the missile proving grounds at the north and to Patrick AFB at the south.

Existing water shortage and distribution facilities will be utilized at the government installations receiving water through master meters at the two principal locations. Elevated storage is provided within the City of Cocoa by means of a 1½-million gallon steel tank with a high water level 155 feet above the top of its foundation. The entire project is estimated to cost approximately $8 million.

The contract for constructing the wells was given to Layne-Atlantic Company of Norfolk, Va. Thus far seven wells have been completed and tested. They penetrate Ocala Limestone aquifer at depths varying

● **LAYING 36-inch line in downtown Cocoa. A backhoe was used for trenching. The trench reached into Coquina rock and water was a problem, requiring well-points.**

from 500 to a little over 600 feet. They yield from 500 to 1,050 gallons per minute with drawdown varying from 3 to 5 feet. The water is fairly hard but meets fully public health requirements for potable water.

Three separate contracts were let for the construction of a treatment plant, a pumping station and storage facilities. The construction of forced-draft aerators and a portion of the yard piping was undertaken by Lee Construction of Sanford, Fla.; the Crom Corp. of Gainesville constructed one 500,000-gallon and one 1,000,000-gallon storage reservoir. These are prestressed concrete tanks with foundations at or near natural ground level. They serve the combined purpose of storage and provision of adequate retention time to oxidize completely hydrogen sulfide gas dissolved in the well water. The pumping station and the major portion of the piping in the yard was contracted by Hubbard Construction of Orlando.

Treatment at this plant consists of aeration for removal of hydrogen sulfide; fluoridation; and chlorination. Provision will be made for corrosion control by stabilization of the water either by pH adjustment or by the addition of poly-phosphates, as needed.

The pumping station will have an ultimate capacity of 12 mgd, with a total discharge head of 175 feet. The ground elevation at the pumping station is 75 ft. above sea level. It is not expected that 12 mgd will be needed for at least 5 years. Consequently pumps being installed will have a capacity of only 11 mgd. Provision has been made, however, for the installation of additional pumps without change in the piping layout.

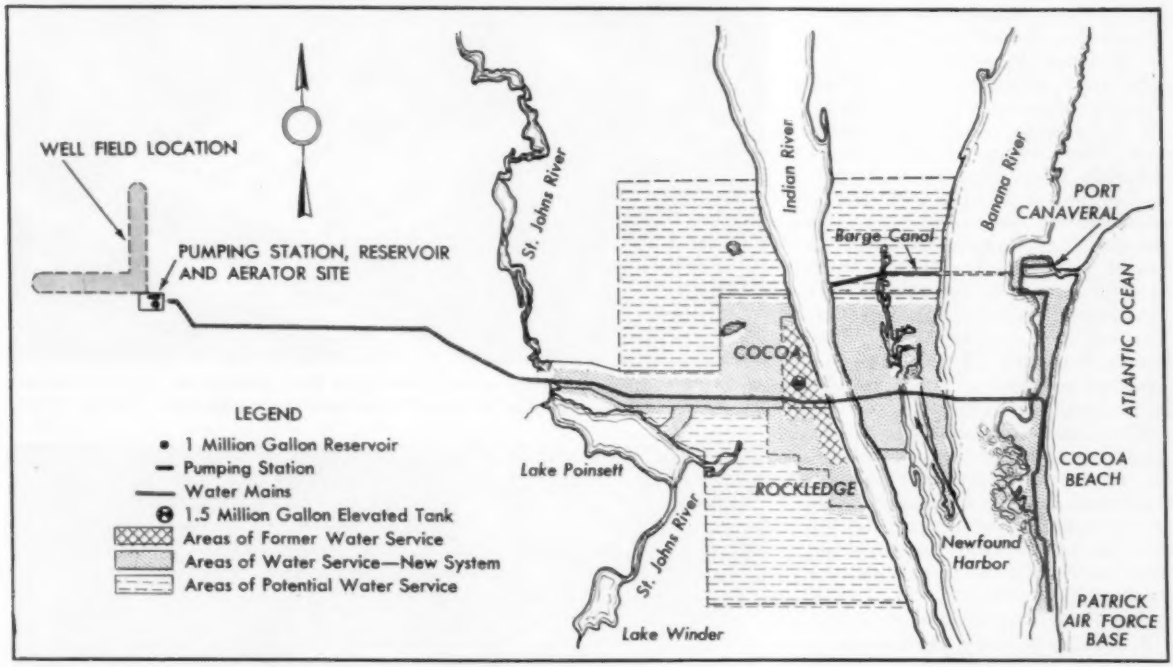
Pipe Line Construction

The transmission main project required the construction of six subaqueous crossings. At one crossing, the St. Johns River, the normal channel is approximately 500 feet wide; the flood plain of the river at this point is several miles wide. The 36-inch pipe line in the vicinity of the river was placed in the shoulders of the road fill through the wide flood plain and then, as the normal channel was approached, the pipe was routed some 100 feet downstream from the bridge and crossed the main channel five feet beneath the bottom of the river.

The construction of the line through the flow channel required a steel sheet piling cofferdam to facilitate removal of water during the laying of the line. When the line was completed on one half, the cofferdam was removed to the other half.

East of Cocoa, the 36-inch line has five salt water subaqueous crossings. The first crossing is the Indian River just east of the city bulkhead. At this point, the Indian River is the main channel of the Intra Coastal Waterway between Jacksonville and Miami. A second major crossing is under the navigation channel in the Banana River, just west of the Beach mainland. Both of these main crossings were laid from floating equipment, utilizing divers to joint the pipe. The pipe was laid to a depth sufficient to prevent future uncovering of the pipe should the navigation channel be deepened. In the Indian River, the top of the pipe is 18 feet below mean low water and in the Banana River, 24 feet.

Because the distance between the pumping station and the major consumers of this water system is so great; and due further to the fact that the pump station is in a relatively inaccessible area surrounded by miles of pine trees, palmettos and cypress swamps, complete automatic supervisory control has been provided for all well pumps. Provisions also have been made for automatic starting and stopping of the distribution system pumps by variation in water level in the tank. The level variations and control signals are transmitted to the pump station by telemetering equipment using telephone circuits.



● WELL field location, about 30 miles west of Cocoa, is shown at left. About 16 miles additional of main were required to distribute water to Cocoa Beach, Patrick Air Force base to the south and the Cape Canaveral area to the north.

THE ACCELO-FILTER SYSTEM OF

H. W. GILLARD,
Infilco Incorporated

THE ACCELO Filter system as applied to the treatment of sewage and industrial waste is based upon the principle of direct return of the effluent from a biological filter to the inlet of that filter or some preceding filter. Recent improvements include means of equalizing flow and organic load to each filter of a two stage plant so that both are maintained at maximum efficiency. Fresh active organisms may also be returned from a second stage filter to the inlet of a first stage filter either with or without intermediate clarification. Conventional rate or high rate filters may be designed to include direct recirculation. In either case, continuous filter dosage serves to minimize, or to eliminate, odors and insects sometimes associated with intermittently dosed filters. A well nitrified effluent with a low BOD can be obtained with the conventional rate Accelo Filter (loaded to about 0.3 pound per cubic yard). The high rate unit, which rarely provides nitrification, will give a greater BOD removal per unit volume of filter media. Selections of filter size and loadings are made to obtain the desired quality of effluent.

The direct return of active aerobic organisms, continuously available to the incoming waste, results in intensified biological oxidation. This is the basis for the success of direct recirculation in the Accelo Filter systems. Several such systems are covered by patents.

The advantages of the method are:

1. Smaller primary and final sedimentation tanks are used because no recirculated sewage enters either clarifier. This results in a smaller initial investment.

2. Direct recirculation maintains a favorable environment for the organisms and thereby accelerates biological oxidation.

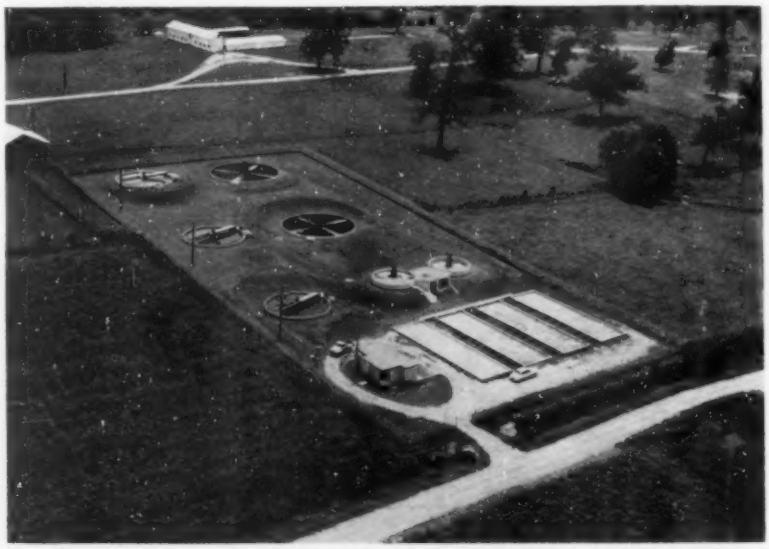
3. Higher dosage rates may be used, and the capacity of existing filters is thereby increased.

4. Clogging and ponding are practically eliminated.

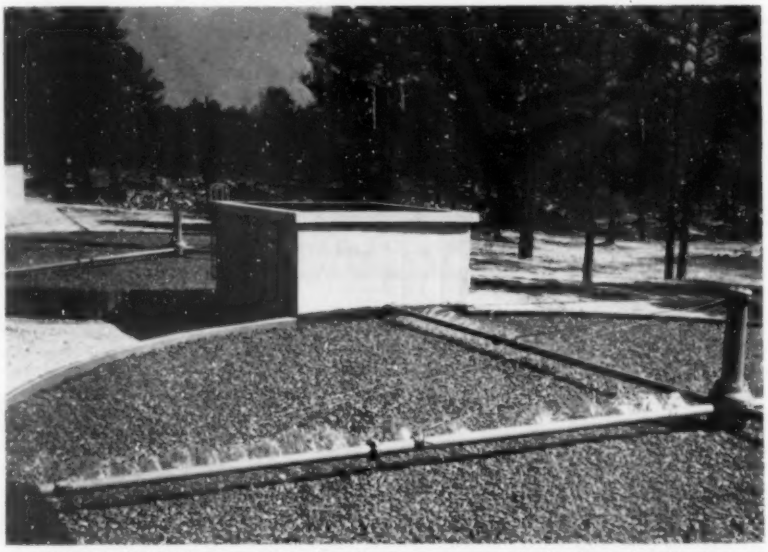
5. Continuous and uniform dosing reduces septicity and *Phychoda* fly nuisance.

All the flow diagrams may be used for either low or high rate filters. The reductions in BOD and suspended solids are based on high rate application with 1:1 recirculation for normal strength domestic sewage. Greater reductions can be obtained with conventional rate applications to the filter.

Selection of the flow diagram and rate of application for a particular project will be governed by such factors as: the degree of treatment required; topography of the plant site; existing treatment facilities; possible savings in initial investment for recirculation pumps and piping; and operational power costs. Various



● **SEWAGE treatment plant serving Mississippi State College at Starkville utilizes the Accelo system, producing a fine effluent from these high rate trickling filters.**



● **FORT JACKSON, near Columbia, S. C., was one of the first installations of Accelo high rate filters. Since 1940, about 160 such installations have been made.**

combinations of the flow patterns may be included in a plant design. Primary roughing filters may be employed in multi-stage treatment of high strength wastes.

Biological oxidation in a trickling filter proceeds most rapidly and efficiently when the biological population in the filter is in an active condition. This condition requires ample oxygen, ample food and proper temperature. For optimum removal of organic pollute, these factors, together with adequate contact time, make up the essentials of excellency in filter operation. Treatment results from actual installations of the Accello Filter are given elsewhere in this article.

The intensified biological action is no doubt the prime reason for the absence of clogging in filters employing direct recirculation. Although the flushing action of the dosage of high rate filters may also be a factor, the number of conventional rate Accelo Filters in service which have not experienced clogging substantiates the intensified biological action theory.

Bases of Design

In the design of an Accelo Filter plant for either high rate or conventional rate operation, both primary and final clarifiers should be selected on the basis of flow in accordance with requirements of the local State Sanitary Engineering Division. The usual practice is to provide an overflow rate of not more than 800 gallons per square foot per day and a detention time of 2 to 2½ hours based on the average sewage flow rate.

Final plant effluent requirements will dictate the selection of application rate, the permissible loading on the filter, and the degree of recirculation for projects designed in accordance with the standards proposed by the Upper Mississippi River and Great Lakes Boards of Engineers. For projects not using these standards, design curves furnished by the manufacturer may be used as a design basis.

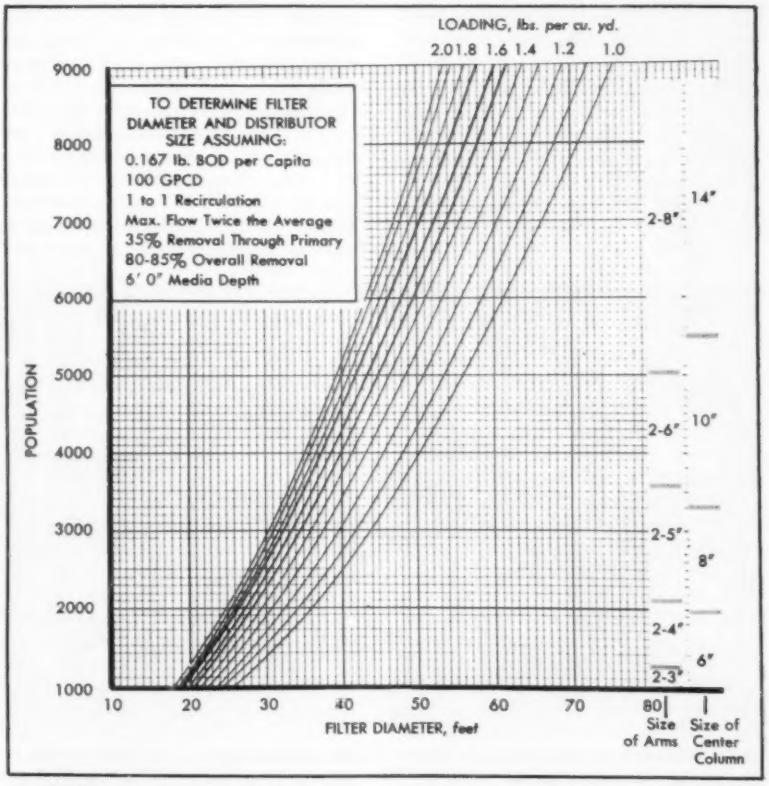
BOD Unit Loadings.—For the treatment of normal domestic settled sewage a loading of 1 to 1.5 lbs. of BOD per cubic yard of filter media, which is equivalent to 1,613 to 2,420 lbs. per acre-foot per day, may be used for single-stage high-rate filters in the northern states; and a loading up to 1.87 lbs. per cubic yard per day, or 3,000 lbs. per acre-foot per day, in southern states. A maximum hydraulic loading of about 30 mgd, including recirculation, should be used. It will be noted that these design loadings will come within the requirements of the Upper Mississippi Valley joint statement of policy for the high-rate filter.

Design Considerations.—The sizing of the Accelo filter and rotary distributor depends upon the BOD loadings used and the desired quality of the effluent. The accompanying graph will be useful in designing a system to suit any domestic sewage problem. The recommended loadings run from 1.45 to 1.75 lb./cu. yd., though all loadings between 1 lb. and 2 lb./cu. yd. are included in the graph.

If the receiving stream characteristics indicate the need of a well nitrified plant effluent, a low-rate filter loading rate of 400 to 600 pounds of BOD per acre-foot (0.25 to 0.37 lb. per cubic yard) of filter media per day should be used; and on this basis the hydraulic loading will seldom exceed 6 mgad. Some results of operation from recent installations show what can be accomplished with direct recirculation. Phenol removals at Saegerstown, Pa. and Sarnia, Ont., in the treatment of industrial wastes will be of particular interest.

Materials

Accelo Hi-Cap® underdrain tile and filter media 3-inch to 4-inch in size should be provided for better ventilation. To provide increased ventilation, tile wall reducers for the Hi-Cap tile are available. These tile reducers are made for all types of high rate or high capacity filters.



● **FILTER diameter and distributor size are shown for various population loads.**

Slope of the underdrains and the collection channels should be chosen to handle maximum flow rates with ample conduit area available for good ventilation. Slopes of 0.5 to 1 percent are recommended where plant site topography permits. Such gradients will usually provide cleansing velocities of 2 feet per second or more. These gradients will also permit higher than design capacity should unknown future loads require it.

Rotary distributors equipped with Aero-Spray nozzles are furnished for high rate Accelo Filters. It is obvious that each rotary distributor must be designed to function properly at the flows and under the head conditions of a particular project.

Pumping Details

If available head at the plant site permits gravity flow through the entire plant, recirculation pumps controlled by an automatic float switch in a control well will serve to maintain a predetermined constant head on the distributor. Where pumping at the plant site is required, the same pumps may be used for functions of both lift and recirculation; they also may be used where material to be directly recirculated flows over a weir from the filter effluent well into a wet well which receives settled sewage from the primary clarifier. The liquid surface elevation and, consequently, the head on the weir are more or less fixed by the effluent weir level of the final clarifier, consideration being given to clarifier feed pipe and other losses. Any high-grade open-impeller type centrifugal sewage pump or axial flow pump may be used for this service. The axial flow pump provides the most economical unit for the higher discharge rates.

Typical Plant Layout

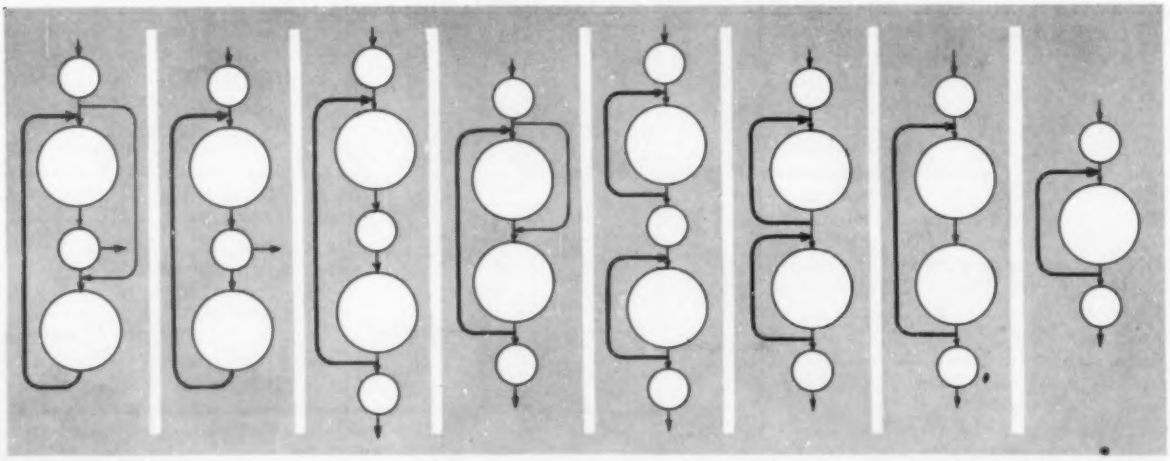
A typical plant layout of a high-rate or high-capacity Accelo Filter with lift and recirculation pumps includes grit remover, Griductor® comminutor, Parshall flume flow meter, primary clarifier, primary clarifier wet well, control well, Accelo Filter, filter effluent well, final clarifier, digester and sludge drying beds. Although the layout refers to a high-rate Accelo Filter, the direct recirculation system may be advantageously used in the design of any biological filter at any desired filter dosage rate. The plant layout would be much the same as that shown except that the filter would be larger.

The pumps should be in duplicate so as to provide for standby service, and the entire plant, including the distributor, must be designed to handle maximum flow rates. Where there is gravity flow through the plant, and recirculation pumps only are to be provided, the plant and distributor should be designed with a maximum discharge capacity equal to the total capacity of all recirculation pumps plus the average flow rate. Where lift and recirculation pumps are used, the entire plant and the distributor should be designed to discharge a maximum volume equal to the total discharge from all pumps. The discharge of any reaction driven rotary distributor is directly proportional to the square root of the head; therefore, if a distributor discharge range greater than about 2 to 1 is required, a four-arm distributor is needed. This is arranged so that only two arms will discharge at low flow rates and all four arms at maximum flow rates. Usually a two-arm rotary distributor will be the most economical, provided the capacity range is suitable. For better aeration the use of Aero-Spray® nozzles is recommended, with the centerline of the distributor arms placed 8 inches to 12 inches above the level of the filter media.

The Accelo Filter system requires no greater operation knowledge or technique than is required for any conventional biological filter. The use of automatic float switches to operate the recirculation pump or the recirculation and lift pumps may eliminate manual attention to the only function not present in the conventional filter. Continuous application of sewage to the filter tends to eliminate difficulties with odors and filter flies. Inoculation of sewage, as it is applied to the filter, with fresh, well aerated filter effluent, in addition to repeated passages of the sewage through the filter, produces increased reduction in organic content of the sewage undergoing treatment.

The usual procedure in the treatment of normal domestic sewage is to recirculate 100 percent to 200 percent of the average flow rate. For the treatment of high strength organic waste, a much higher rate of recirculation may be necessary to produce the desired results and several stages of treatment may be needed.

The first plant scale Accelo Filter went into operation in the late fall of 1940. Since that time more than 160 such plants have been installed, involving a greater number of filter units.



● A NUMBER of different recirculation design arrangements are possible for use with the "Accelo" filter. In the diagrams above the larger circles represent filters, the small circles are clarifiers and the heavy lines show the recirculation paths. Various BOD reductions ranging from 80 to 95 percent may be expected, depending on recirculation and layout used.

ESTABLISHING THE BOUNDARIES OF ROADS CENTURIES OLD

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LOCATED in southwestern Maine, Cumberland county has an area of 853 square miles. It consists at the present time of the cities of Portland, South Portland and Westbrook, together with twenty-three towns. It was incorporated in 1760, when it comprised a much larger area than it does today, as several counties were later formed in the area that it formerly occupied.

"The King's Highway," which extended from Boston to Machias, was laid out as a military road in 1761, and extended through the county. Many other roads, particularly along the coast, were laid out prior to the Revolutionary War. Some of these roads extended inland from landing places on the coast to falls on the streams in the interior, where water power was available and mills could be established, as this was the only power that the early settlers had.

In the early days there were three classes of roads. First, there were the county roads, which usually extended through two or more towns; second, town roads, located in one town only; and third, private roads, which were laid out to provide access to accepted roads, usually for the use of only one family.

The county roads were then the most important roads, and usually they were four rods, or sixty-six feet, in width. This width was established, not in expectation of excessive traffic, but in order to enable vehicles to avoid obstructions, such as stones, stumps and mud holes, without going on private property. There were two roads in Cumberland County that were laid out six rods, or ninety-nine feet, in width, and one road, which is now Maine Street in the town of Brunswick, that was laid out twelve rods, or one hundred and ninety-eight feet in width.

The town roads were usually three rods wide or forty-nine and one half feet, although some of them were four rods, or sixty-six feet wide; and a few were only two rods, or thirty-three feet wide. Very rarely two and one half rod measurements were used. The private roads were nearly all two rods or thirty-three feet wide but there are a few that were only one rod and in two instances the width was given as a rod and a half.

● **MILESTONE 135, marking distance to Boston on King's Highway, Boston to Machias, Me., dates back to about 1761.**

Roads Laid Out Years Ago

Most of these roads were laid out from one hundred and fifty to two hundred years ago, and apparently very few permanent markers were used to designate the boundaries. Consequently there is nothing to mark them now.

In the State of Maine the "through" or state roads, as well as some of the state aid roads, are laid out, built and maintained by the State, whereas the municipalities build and maintain the town roads together with some of the "county" roads which are those that lead from one town to another.

In the early days the Counties laid out the "through" roads, paying the damages incurred in acquiring the location, while the town through which the road passed built the section of the road that was located in that particular town.

Previous to 1831 the laying out of roads in the County was carried on by the Court of General Sessions. In that year the County Commissioners were established, and they carried on the work until the highway commission was formed.

The towns in the vicinity of the three cities of Portland, South Portland and Westbrook are urbanizing rapidly, and becoming residential districts for people who are employed, or who do business in these cities; and, with zoning regulations in these towns requiring set-backs from the street line for new buildings, it has become necessary to re-establish the lines between public and private property.

The State and the Counties have authority to do this work; the State Highway Commission may establish the boundary line on any State or State aid highway, and the County Commissioners may do the same on county roads, that is on roads that lead from town to town; also on town ways when a properly worded petition from the municipal officers of the town is presented to them.

The counties may also lay out town roads in cases where the municipal officers "unreasonably refuse" to do this; but the major road building progam is vested in the State.

The petition by the municipal officers for a hearing on a re-definition by the county is advertised in some newspaper for three successive weeks, the first appearance being thirty days before the date of the hearing, and notices are posted in three public places in the town that has petitioned for a re-definition. Also a notice is served on the town clerk. A hearing is held on the ground at the specified time, and any person or corporation may appear and offer any evidence they may have. The Commissioners view the road in question, and usually decide that the re-definition should take place.

Much Research Is Needed

Owing to the fact that many of the early roads were laid out from points opposite named residences, research is necessary to establish these points on the road to-day; for many of these residence-owners lived one hundred and fifty to two hundred years ago and some of the early descriptions simply say "as the road now goeth." While most of the early road descriptions have magnetic compass bearings, the angles were not read closer than one degree, and many of the angle points were marked by certain stumps or trees which are no longer there. The measurements also were not very accurate, making it impossible to re-establish the road by

the original survey. Consequently it seems best, in the absence of definite proof regarding the road boundaries, to take into consideration the location of the road as it is on the face of the earth to-day, and to re-define and straighten it as much as possible without causing undue hardship, using the width of the road that was given when it was accepted.

In some cases the general boundaries of the principal roads are fairly recognizable, owing to the fact that fences were erected along the roads when they were laid out, because all livestock was driven to market on foot in the early days.

These fences have been gone for many years, but trees which started to grow along the fence lines one hundred or more years ago, are now very large, and show to quite an extent, where the original boundary lines were. In some instances stone walls were built, not always following the property line, but on ground where the wall could be most easily erected, and in such cases they are not too reliable. On many roads however walls were built that follow the property very well.

Occasionally there are buildings that encroach in the area originally set apart for the road. If they have been there over forty years they form the road boundary at that particular place as long as they remain standing unless damages are awarded for their removal.

Base Line Is First Established

The early roads were laid out as a series of straight lines, no curves being used, and consequently the counties usually follow the same practice today. The procedure is first to establish a base line with one hundred foot stations, marked by nails driven in the road surface, or by stakes driven flush with the ground when not on the road surface.

When working on roads having limited traffic, the center line may be used for this, but usually a line off-set from the center is necessary, and on very busy roads it may be necessary to establish a base line on either side of the traveled area. From the base line all houses are located within twenty-five feet of the street line. Also all trees within or on the street line, together with culverts, private driveways, hydrants, monuments, intersecting roads, etc. The travelled surface of the road, whether bituminous macadam, cement or gravel, is accurately plotted with reference to the base line at each hundred foot

● **NEW granite monuments have been placed to mark angle points on property lines on both sides of right-of-way.**

station. Stakes are driven at the angle points on the property line on both sides of the road, the actual point being marked by a nail in the top of the stake. These later are replaced where possible with granite monuments six inches square and extending below the frost line. The actual angle point is marked by a drill hole in the top of the monument, which may be set flush with the ground on lawns, or where there is traffic. In other locations the monument may extend above the surface several inches. On ledge locations drill holes are established at the angle points. Should a curve be used in the re-definition, the point of curvature and the point of tangency are marked by stone monuments on the property line, and in the case of long tangents, monuments are set at five hundred or one thousand-foot intervals, or on the tops of hills, as occasion demands.

A crew of four men is generally used on the surveys. The starting point of each survey is tied in by reading the angles and taking measurements to established reference points, such as corners of foundations, drill holes in ledges, etc. It has not yet seemed feasible to tie the surveys into the USGS surveys.

All the features above mentioned are shown on a plan of the road accurately plotted to a scale of forty feet to the inch on sheets of tracing cloth twenty by thirty inches. These with legal descriptions of the roads are filed in the County Commissioners' Records, and are open to public inspection. This information is used extensively by engineers, surveyors, attorneys, real estate operators and public utility corporations.

Two copies each of prints of the plans, and a copy of the legal description of the road are given to the municipality in which the road is located, to be placed on file in that particular town.

Work Priority

A priority system on road re-definition is set up by the county giving proper attention to the urgency of the petitions and to make sure that one town does not have more than its fair share of attention in this matter in any one year. While many of the roads have been re-defined and granite boundary markers established there are still many roads on which nothing has been done. With modern earth moving machinery the destruction of existing monuments is far greater than it ever was before due to carelessness and ignorance of many contractors, consequently it seems that road re-definition will be quite a problem for some time to come in Cumberland County.

● **BASE LINE establishment along the old King's Highway. Where there are existing fences, these are sometimes helpful in finding the original lines. Where the old fences have disappeared, larger trees may aid in locating the original lines.**

LIGHT EQUIPMENT
for SMALL TOWN
SANITARY LANDFILL OPERATIONS

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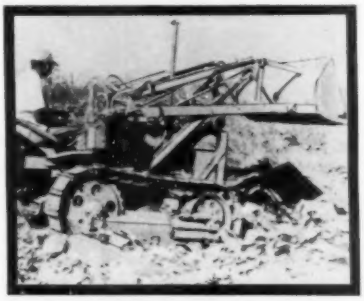
A PROPERLY operated sanitary landfill is recognized as one of the best approaches to municipal refuse disposal. Flies, mosquitoes, rodents, and many public nuisances associated with improper refuse disposal are almost completely eliminated by this practice at costs that most communities can afford. According to a PUBLIC WORKS survey there were more than four times as many municipalities in the United States using this method of disposal in 1953 as in 1940 (1). However, other studies have indicated that sanitary landfills are used much more extensively in large communities than in those with less than 10,000 population (2, 3). Furthermore, it is evident from a literature review that considerable information is available to guide cities with greater than 10,000 population in planning sanitary landfill operations (4, 5, 6), and a wide variety of heavy equipment has been adapted to the particular needs of large-scale operations (7). The same type of engineering data and experimentation with light equipment has not been available to smaller communities. The present studies were devised to assist such communities with less than 10,000 population which desire the economic and public health advantages of sanitary landfill but cannot afford the large initial investment necessary for heavy equipment.

It has been suggested on various occasions that light equipment costing well under $10,000 could be used to operate a sanitary landfill in a small town. Field demonstrations have shown that such equipment can be used with reasonable satisfaction for compacting and covering household and light commercial refuse in a site prepared for operation by prior excavation with heavy equipment (6, 8). The present investigations cover the practicability of sustained operation of light equipment for carrying out all phases of sanitary landfill operations with all of the refuse from a community without prior excavation by heavier equipment.



● **TRACTORS were tested severely on landfills to determine the proper size.**

Equipment Investigated

It was assumed that the most practical type of light equipment which could be used for the complete operation of a landfill for a small community would be a crawler tractor with a front-end bulldozer or loader attachment. On the basis of drawbar horsepower and weight including the front-end attachment, these smaller tractors logically divide into 3 groups: Group 1 has 20-25 DBHP, and 2-3 tons total weight; Group 2 has 25-30 DBHP, and 3-4 tons total weight; and Group 3 has 30-40 DBHP, and 4-8 tons total weight. In general, the sturdiness of the tractor frame varies with the tractor weight. A gasoline powered tractor from Group 1 with a half-cubic-yard bucket and a diesel powered tractor from Group 3 with a bulldozer blade were evaluated in this study.

Site Selection and Preparation

Chandler, Arizona, an agricultural and winter resort community with an average population of about 4500 people during the period of the investigation, expressed a desire to cooperate in a light-equipment sanitary landfill study. The town agreed to furnish a suitable fenced area with access roadways and to deliver refuse in the quantities and manner required for the study. The landfill site was located on municipal property about three highway miles from the town, an area that will eventually be used for recreational purposes. The site was nearly level but somewhat lower than most of the surrounding area. The soil was heavy silty clay-loam partly cemented into a lime-cabonate hardpan known locally as "caliche" (9). This relatively hard caliche provided a moderately severe situation for testing the excavating ability of light equipment. A 2-foot dike was constructed around the landfill site to prevent rain and irrigation runoff from the surrounding area from flooding the landfill. A small inexpensive storage building was constructed to protect equipment and supplies.

Results and Observations

Only a portion of the municipal refuse was accepted at the landfill during the initial operations so that an inexperienced tractor operator could be trained adequately and orderly operating procedures could be developed. After this period all refuse from Chandler was disposed of in the landfill except during periods of mechanical breakdowns of the tractors. The finished fill area was 3 to 4 feet above the initial ground level and consistently of a quality that met the approval of visiting Public Health officials. The trench method was used, varying the depth and width of the trench but maintaining a 6-inch daily cover and a 2-foot blanket of final cover. Detailed records of costs, time, refuse volume and weight, nature of refuse, placement of refuse, compaction and settlement were maintained.

The slow approach to training an operator and modifying the operat-

ing procedures proved highly successful. Initially with the Group 1 tractor, it was found that the usual operating procedure for heavy equipment had to be modified considerably to attain efficient operation with the small unit. Slopes of more than 20 degrees had to be avoided because the equipment lost efficiency and sometimes upset. This necessitated working on a gradual slope and resulted in slow, inefficient and inaccurate digging. To overcome this difficulty, refuse was spread along a gradually descending ramp that led toward the nearly vertical "advancing front" or "digging end" of the trench. Cover material was spread after digging by backing upward over the compacted refuse. The added travel over compacted refuse gave thorough compaction with the Group 1 tractor, but more compaction time was required than with the Group 3 tractor that was tested later. Wire fouled the tracks and wheels of the Group 1 unit to a greater degree than with the heavier tractor. This was overcome to some extent by placing the wire in bundles on top of the compacted refuse just before final covering.

At the recommendation of the factory representative for the Group 1 tractor, standard tracks were replaced by non-grouser type tracks and an extra-low-speed transmission was installed to help prevent stalling and excessive wear on the clutch during excavation. Also, the bucket was modified to facilitate digging. However, numerous ruptures in integral parts of the tractor frame occurred, associated mainly with high torques on the frame as the tractor passed over large solid objects in the fill during compaction. The digging operation caused some breaks in the bucket supporting members. During six months of intermittent operations with the Group 1 tractor, 12 breakdowns occurred which were repaired at a cost of $907.79. This figure does not include the cost of the various tractor modifications made for more efficient operation at the recommendation of the factory representative. The final phase of the study with the Group 1 tractor had to be terminated after 833 hours of operation plus maintenance (exclusive of repair) time because the engine efficiency of the tractor had dropped too low to warrant further testing without an engine overhaul.

The Group 3 tractor was used in later operations. With this unit it was found that no deviation from conventional heavy-equipment operation was required, except that extra precautions had to be exercised when placing earth cover to prevent mixing refuse with cover material. An attempt to increase the digging efficiency of the Group 3 tractor was made during the last month of the study by installing 4 backripper teeth on the bulldozer blade in such a way as to rip the soil with lowered blade as the tractor backed up the digging slope. This modification, recommended by the manufacturer's representatives, increased the excavating ability of the tractor only slightly.

After six months of continuous operations with the Group 3 tractor,

● **GOOD results under severe usage were obtained with the Group 3 tractors.**

3 minor breakdowns occurred which were repaired for $60.31, not including the cost of the backripper modification. Damage to the tractor was limited to bending of the sand guards along the bottom of the tracks by large solid objects in the fill. At the close of the study the Group 3 tractor was apparently still in excellent mechanical condition after 777 hours of operation plus maintenance (exclusive of repair) time.

Refuse production in Chandler averaged 68.6 tons per week (10). Except for brief periods during the study, the Group 1 tractor was never capable of disposing of all of the Chandler refuse during a 44-hour work week, due largely to "break-down-time" resulting from mechanical failures. In contrast, the Group 3 tractor was able to dispose of all refuse from Chandler in an approved manner in an average of 29.7 hours per week of operation plus maintenance time. Equally satisfactory sanitary landfill were obtained with both machines. The density of the compacted refuse in the fill ranged from about 400 to 600 pounds per cubic yard, averaging about 500 pounds per cubic yard. A year after completion of the study settlement averaged less than 0.1 foot.

For purposes of this investigation, operating costs were calculated in terms of the purchase price that would be paid by the City of Chandler for materials and labor, as follows: Operator's salary, $57.64 per week; gasoline, 23.6¢ per gallon; diesel fuel, 16.1¢ per gallon; oil, 84.4¢ per gallon; and grease, 35¢ per pound. Comparisons on performance and operating costs of the Group 1 and the Group 3 tractors used during the entire investigation are:

The Group 1 tractor disposed of an average of 1.27 tons of refuse per hour of operation plus maintenance time as compared to 2.31 tons per hour with the Group 3 tractor. Exclusive of first cost and modification expenses of the tractors, the disposal cost per ton of refuse was $2.13 with the light weight Group 1 tractor and $0.66 with the heavier Group 3 tractor. The $0.66 cost per ton with the Group 3 unit compares favorably with operational costs of larger-scale landfill operations (11,12).

Summary and Conclusions

(1) Spreading and compacting refuse in a sanitary landfill for a large or small city requires rugged equipment to withstand the torques that are developed on the tractor frame when running over the large solid objects present in the total amount of refuse from a city regardless of size. Durability and dependability of equipment as well as economy in initial purchase price and in operational costs must be considered in purchasing a tractor for landfill use.

(2) The Group 3 tractor used in this study was dependable and durable and the operational cost compared favorably to costs of heavy equipment in large-scale operations.

(3) The operating costs of the Group 1 tractor when used as the sole mechanical unit for operating a sanitary landfill were excessive because of the low rate of disposal and the high repair costs.

(4) The Group 1 tractor that was studied was not sturdy enough for the sustained operation of all phases of sanitary landfill. It may be suitable in very small communities where soils are light and easy to excavate. The equipment has been used satisfactorily in some situations with prior excavation and with household and light commercial refuse only.

(5) Under the circumstances encountered in this study, the Group 3 tractor equipped with an ordinary bulldozer blade adequately and economically performed in a 30-hour work-week all of the necessary

phases of a sanitary landfill operation for a city producing 69 tons of refuse weekly. It appears capable, therefore, of handling 100 tons of refuse per 44-hour week and considerably more in areas where soils are light and easier to excavate.

(6) Critical testing of Group 2 units and other units in Group 1 is necessary before broad conclusions can be made on the most economical tractor for small landfills.

(7) On the basis of this investigation, it is the opinion of the writers that a reconditioned, factory-guaranteed Group 3 tractor purchased at the approximate cost of a new Group 1 tractor would perform small-town sanitary landfill operations more satisfactorily and economically than a lighter, less durable new tractor in the Group 1 class.

(8) In beginning a sanitary landfill operation, a slow cautious approach in accepting refuse and progressively modifying various phases of operation is recommended as a good method for training an inexperienced operator and devising optimum techniques to fit individual situations.

Acknowledgement — The authors acknowledge the assistance of the City of Chandler, Arizona, for furnishing the site for the landfill, arranging for services of public scales, and for cooperating in all other phases of the investigation.

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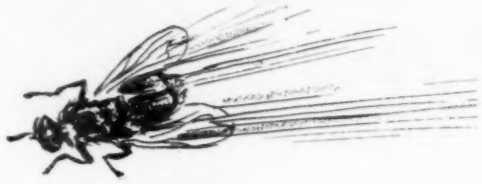

Effect of EARTH COVER on FLY EMERGENCE from SANITARY LANDFILLS

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and
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HOUSE FLIES (*Musca domestica*) were used in laboratory tests, conducted during the summer of 1955, to determine what effect earth cover has on fly emergence. These tests, which were described in an earlier report[1], indicated that house fly emergence through soil could be prevented by compacting the soil at or near the optimum moisture content, in layers which varied in depth from 1⅝ inches to 2¼ inches. On the basis of these findings, it was postulated that three to six inches of earth cover so compacted would prevent fly emergence under field conditions; it was also postulated that no reasonable amount of uncompacted cover would prevent emergence, since house flies emerged through five feet of uncompacted earth cover.

During the summer of 1956, a field investigation was undertaken to test the laboratory findings of the previous year under established operating conditions at several sanitary landfills in California. Six operations were selected which had a history of being well operated by existing standards and represented a variety of local conditions. As was expected, the compaction of the earth used to cover the refuse varied considerably due to the types

of soil used, the methods of operation, and the equipment available for compaction.

Although the laboratory tests were limited to studies of the house fly, under field conditions other species of flies also had to be considered. Of the several thousand species of flies in California, many are found in mixed refuse at various times because of its heterogeneous nature. Fortunately, the important fly species occurring in mixed refuse use the same means as house flies to force their way through soil. Eggs are deposited in moist organic matter in the refuse before it is collected, and also at the disposal site if the refuse is not promptly covered with earth. The eggs hatch into larvae which go through three feeding stages called instars, and then turn into inactive, non-feeding pupae. When transformation is complete, the fly pushes off the end of the pupal case with the ptilinum, an inflatable sac that protrudes from the frontal region of the head. By alternate expansion and contraction of the ptilinum, the fly opens a passageway through debris or soil to the ground surface.

At each of the six landfills, larvae were collected as near as possible to the spot where emergence traps were to be placed after the earth cover was applied. Traps were placed only over refuse infested with fly larvae so that negative trapping results would indicate control of emergence, rather than a lack of larvae in the refuse. Adult flies were collected by sweeping with a net and by using baited traps. Both the larvae and adults were identified and a tabulation made of the species found at each landfill.

Soil Samples Taken

Soil samples were taken and the depth of the earth cover measured in each case after the fill was finished. Soil moisture content was calculated from samples collected and placed in sealed jars. Soil textures were classified according to the U. S. Department of Agriculture's triangular diagram, "Guide for Textural Classification"[2].

Initially, it was planned to measure the bulk density of the earth cover of the finished fill, assuming that there would be a correlation between the bulk density and the ability of flies to emerge. However, such correlation could not be demonstrated because of the difficulties of soil compaction testing in general and on landfills in particular. In landfill operations, where bulldozers are used for placing the earth cover and compacting it, soil is deposited in one layer. Assuming that the soil contains adequate moisture, repeated tracking by the bulldozer leaves a hard layer at the surface. Within the soil layer, however, the compacting force is rapidly dissipated with depth, so that a gradient of density is attained from the top down. The presence of the spongy refuse below the earth cover intensifies this problem. Consequently, it was impossible to determine the point in this gradient which prevented the emergence of flies. Despite this obstacle, a practical idea of the sort of compaction achieved was determined by observing the type of soil (textural), the moisture content of this soil, and the size of the bulldozer.

● **MONTEREY operations utilize the trench method. After compaction, the refuse is covered with 12 to 24 inches of compacted soil. There were few larvae present.**

At each landfill, 25 emergence traps were placed 4 to 6 inches apart in two rows of eight and one row of nine. The traps used were fashioned from one-gallon round cardboard cartons, 6¼ inches in diameter. Each trap was placed inverted on the fill material and soil banked around the sides to prevent the escape of emerging flies. A crossed slit was cut on the side near the bottom and a screw top vial was inserted in each carton to indicate the presence of flies in the trap. The area covered by each trap was 0.213 sq. ft., so that the total area covered by 25 traps was 5.33 sq. ft. The traps were checked at weekly intervals, and the flies collected following emergence or after a period of time judged to be sufficient at the temperatures encountered for complete fly development. A pyrethrum aerosol bomb was used to kill the trapped flies by spraying through the aperture made for the screwtop vial. The following sections describe the operating conditions prevailing at each site.

Lodi: This cut and fill operation is conducted in a flat area 8½ miles southeast of the city. Mixed refuse is dumped into a trench 20 ft. wide, 25 ft. deep, and approximately 1,500 ft. long. The soil at this city-operated site is hard-packed fine, sandy loam of the San Joaquin series. An International TD-9 bulldozer is used to spread, compact, and cover the refuse. The trench was excavated and the soil stockpiled at one side of the trench by an excavating contractor. Cover on the top and the longitudinal slopes was from 18 to 24 inches in depth, and had a moisture content of 5.7 percent. The top cover was applied twice weekly and transverse cell walls were closed about once a week. Compaction was achieved by repeated runs over the cover with the dozer. Since the larval population was very high in the refuse and the cover was well compacted, the four flies recovered were probably carried back onto the top of the fill by the tractor.

Monterey: This moving ramp op-

eration is conducted in a large trench on a hilly mesa about six miles east of the City. The site serves five cities and the unincorporated territory within the Monterey Peninsula Garbage Disposal District. The disposal contractor uses a Caterpillar D-6 bulldozer, and a 7½ cu. yd. scraper. The soil at the site is a fine sandy clay loam of excellent compactibility with 8-9 percent moisture content. Mixed refuse is dumped into the trench, shoved up the slope, and compacted with the tractor. At the end of the day's operation, soil is hauled from the opposite end of the trench with the scraper, spread over the compacted refuse, and compacted to a depth of 12 to 24 inches.

There was no opportunity to collect larvae at the time the emergence traps were set out because of the operation of the bulldozer. However, it was noted that there were few larvae in the loads being dumped and few adults were present. A few pupal cases were found on the top of the cover. Since fly pupae are inactive and do not move upward through the soil, the seven flies recovered probably developed from mature larvae or pupae which dropped off the tractor when it was compacting the cover.

In an effort to obtain better controlled conditions, a special trench was dug in an isolated location by the disposal contractor. The trench was 10 ft. wide, 30 ft. long, and 3 ft. deep. Two loads of mixed refuse were dumped in and compacted. This material was left exposed for two days, during which time it became infested with fly larvae. The area was then divided into three parts designated as plots "A", "B" and "C". Plot "A" was covered with approximately one foot of soil at a moisture content of 8 percent and compacted in the manner used in normal operation at the site. Plot "B" was covered in the same way, but not compacted. Plot "C" was covered with one foot of dry topsoil. Twenty-four emergence traps were set out on plots "A" and "B", and eight on plot "C".

Unfortunately, it later became evident that there were large numbers of the beetle *Sapinus lugens* in the refuse. Many adult beetles had emerged by the time the final collections were made and had eaten many flies in the traps set on plots "B" and "C", so only fly fragments were found in the traps. In plot "B", eighteen traps contained adult *Sapinus* and in all but one trap, fly fragments were found, indicating that flies had emerged and been destroyed by the beetles. In plot "C", despite the presence of *Sapinus* in three traps, 31 undamaged flies were found in eight traps. Fragments of emerged flies were found in three plot "C" traps containing beetles. Only two plot "A" traps contained beetles, and the remaining 22 traps contained only four flies. Since pupal cases were found on the ground, these flies evidently were carried back onto the top of the fill by the tractor during compaction.

Oakland: This large-scale area fill is conducted on diked tidelands just outside the city, about eight miles southeast of the central business district. The operator of the fill collects mixed refuse in Oakland and a number of adjacent cities. Two Caterpillar D-7 bulldozers are used to spread and compact the refuse in layers 18 to 20 ft. deep. Since imported soil is supplied daily for cover by an excavating contractor, there is considerable variation in the type of soil used.

Under normal operating conditions, the sloping face of the fill continuously moved forward. At the end of each day of operation the top and sloping face of the fill is covered with 6 to 10 inches of soil. The cover on the sloping face frequently was not well compacted. The top cover, on the other hand, absorbs moisture from the mixed refuse and was found to be compacted to a brick-like consistency by the repeated passes of the tractors and the refuse trucks.

Sampling revealed only a moderate fly population. Since there seemed to be no possibility for fly emergence through the top cover, emergence traps were set out on the sloping face of the fill. A total of 121 flies were recovered from 20 traps set over uncompacted sandy clay conglomerate soil.

San Rafael: This area fill is conducted on tidal marsh land, located five miles north and one mile east of San Rafael. The site serves a number of cities and a large unincorporated area. The disposal contractor uses a Northwest ¼-yard power shovel and an Allis-Chalmers HD-14 bulldozer to obtain cover material from nearby hills. Two dump trucks haul the soil to the fill where it is spread over the compacted refuse by an Allis-Chalmers HD-10 bulldozer. The soil used is a mixture of sandy clay and broken rock. During the fly-trapping period no attempt was made to spread the cover material evenly and compact it. Refuse frequently protruded through the soil cover though in places the cover was 10 inches thick.

● **LODI disposal trench, 20 ft. wide, 25 ft. deep. Emergence was practically prevented by good cover and compaction.**

● **WATSONVILLE uses the trench method, but compaction is inadequate; fly emergence not prevented by 30-in. cover.**

● **SANTA CRUZ landfill is located in a canyon. Material obtained from the hills lacks binder and is hard to compact, resulting in some fly emergence.**

The refuse contained a large number of larvae, and adult flies were also very numerous. A large dairy and its manure storage piles nearby were the most likely source of most of the adults, since the adults were of a different species than the larvae in the refuse. A total of 84 flies were collected from 18 traps.

Santa Cruz: This city operated area fill is located approximately six miles north of Santa Cruz. Cover material, primarily chalk rock, was obtained from the hills on either side of a steep canyon. A caterpillar D-6 bulldozer is used to spread and compact the refuse. The cover material is spread over the refuse in a layer 6 to 12 inches deep and crushed by repeated runs of the tractor. Since there was no binder in the soil used, no compaction of the cover was possible.

Although few larval or adult flies were present, a large number of different species were present. A total of 98 flies of four species were collected from 20 traps.

Watsonville: This city-operated cut and fill operation is located approximately 2½ miles northwest of Watsonville in a gently rolling hill section. The refuse is dumped into the trench and covered with soil to a depth of 30 to 48 ins. by a Link-Belt dragline equipped with a ½-yard bucket. The loamy sand soil used for cover was not sufficiently compacted by dropping the dirt filled dragline bucket on the top of the fill. The sloping face of the fill in the trench was not completely covered. Both larvae and adult flies were numerous. A total of 367 flies were collected from 25 traps.

The results of these tests show that fly emergence was prevented at Lodi and Monterey. Flies were found to emerge at the other sites for a variety of reasons: At Oakland the side slopes of the fill were not compacted; at San Rafael the cover was not uniform; at Santa Cruz the rock had no binder; and at Watsonville the cover was not compacted.

Results and Conclusions

In order to prevent fly emergence by compacting the cover material at sanitary landfills there are four essential factors to consider: (1) soil that can be compacted, (2) suitable equipment for compacting the soil, (3) adequate range of soil moisture, and (4) adequate thickness of cover.

In general, compactibility of soils depends on the gradient of particle size, that is, soils with a homogeneous particle size do not compact as well as soils containing a wide range of particle sizes. As a consequence, nearly pure sands, clays, or silts are not suitable for compaction on sanitary landfills. Crushed rock with no soil binder, while excellent for access roads, is likewise unsuitable. This type of cover was used at Santa Cruz. Low value land, which can be easily excavated, is usually sought for landfills. If it is considered necessary to prevent fly emergence, it is essential to select soil suitable for compaction.

A bulldozer appears suitable for soil compaction with repeated tracking over the cover material. Compaction sufficient to prevent fly emergence could be achieved in most of the operations studied with minor changes in practice. However, where only a dragline is used, additional equipment is needed. In some operations special equipment for compacting the soil probably would be more economical.

Moisture content of the soil being compacted is a critical factor. However, there is apparently a wide range of moisture content which permits sufficient compaction to prevent fly emergence. Of course, the amount of moisture necessary varies according to the soil. The simple test of squeezing a handful of soil is suitable for checking compactibility. If a solid clod is formed, the moisture content is certainly adequate for compaction with a bulldozer. With one exception, the soil at all of the sites studied had sufficient moisture content below the surface of the undisturbed ground.

Exactly what constitutes an adequate thickness of cover for sanitary landfills has been debated at great length because of legal requirements in many areas. The required thickness of cover for particular operations has been adopted by others without regard to the local factors involved. A recent survey[3] revealed that thickness of cover applied varied from 4 to 48 ins. in California. Under usual field conditions, a 6-inch layer of compacted cover should prevent fly emergence. Fly emergence traps can be used to determine the required thickness of cover and the amount of compactive effort necessary for local conditions.

These field tests show that even good soil at an adequate moisture content, and the right equipment to compact it, are insufficient without knowledge of the above factors and subsequent careful operation: For example, at San Rafael the earth cover was not placed uniformly. Although the cover was 10 inches thick in spots, there were places where the refuse was left uncovered. Where the side slopes of the fill were not compacted, as was the case at Oakland, there was no control of fly emergence from these areas. Whenever such an area is bypassed long enough to permit the development of fly larvae it should be compacted.

In general, the necessity for preventing fly emergence at a disposal site depends on many local conditions. When operating near residential areas, the added work of compaction will usually be less expensive than a longer haul to a more isolated site. Even if soil conditions are not suitable for compaction, the fly production problem can be greatly reduced by spreading and compacting the refuse and then promptly covering it with soil. Only a thin covering is necessary to prevent flies from laying more eggs on the refuse at the disposal site. Fortunately, this is critical only during warm weather. During cool weather, when adult flies are not numerous, covering can be less frequent unless there is a major source of flies nearby. Obviously, if only rubbish is handled, fly problems are usually minor, because there are few fly larvae in this material when it arrives at the disposal site.

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2. "Soil Survey Manual", U. S. Department of Agriculture, U. S. D. A. Handbook No. 18, pp. 207-211, 1951.
3. Black, R. J. "Sanitary Landfills Serving California Communities", *California Vector Views*, 4:2, February, 1957.

SEAL TREATMENTS

ON BITUMINOUS CONCRETE PAVEMENTS

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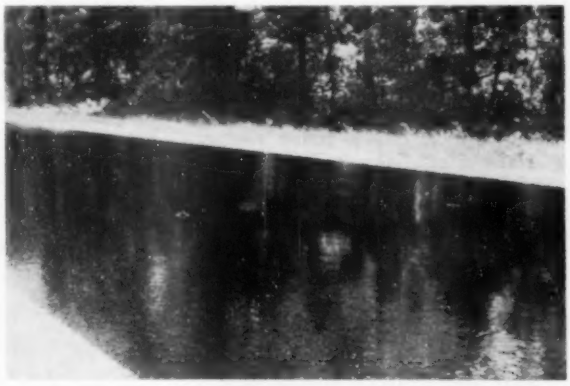
THE DEMANDS for increased services and higher type maintenance are making it increasingly difficult to make ends meet with the maintenance dollar. Requirements for matching funds to finance the State's share of construction costs on the Interstate System prevent any major increase in maintenance allocations in the near future. It is, therefore, necessary to use the most economical types of pavement maintenance and at the same time attain maximum pavement life.

It is generally conceded that the most desirable pavement resurfacing is either a mixed-in-place treatment or a bituminous concrete overlay with a thickness of approximately an inch to an inch and a half. Available maintenance funds too often are not sufficient to finance such an application. On the other hand, pavements often suffer only from oxidation of the asphalt and are basically capable of additional years of service, this being particularly true in the case of local material sand asphalt mixes with comparatively low densities. A seal treatment applied to one of these pavements at a cost of from one-fourth to one-eighth the cost of a resurfacing mat will often provide from three to five years additional pavement life, prior to the next major resurfacing operation.

The success of a seal treatment is largely dependent upon the protection provided during the curing period. The heavy traffic volumes and weights now experienced make it extremely difficult to provide adequate protection on many roads unless detours can be provided. The ideal location for a seal treatment is on a multi-laned or divided highway where traffic may be routed over adjoining lanes during the curing period. On single lane highways, protection can be obtained by using one-way traffic, with a pilot vehicle to control traffic speeds within desirable limits.

Seal treatments are applied in Virginia both by State forces and

● **DISTRIBUTOR is applying bituminous material at rate of 0.20 gallon per sq. yd. Cutback or emulsified asphalt is used.**



● **CLOSE-UP view of the surface after the bitumen has been applied but before the placement of any cover aggregate.**

● **SLAG is being used for the cover material on this job. Average rate for slag application is 16 to 20 lbs. per sq. yd.**

● **ROLLING with 8-ton steel wheel roller. Rubber-tired rollers are required when sand is used for cover aggregate.**

● SWEEPING back loose aggregate prior to application of bitumen to second lane. Surface must be dry and clean.

● JOB IS completed. Seal treatments cost much less than a mat and will give good service for period of 3 to 5 years.

by private contractors. Of our over-all bituminous surface treatment work (exclusive of plant mixed bituminous concrete) approximately 75 percent is performed by contract. In the application of seal treatments on bituminous concrete pavements, the bitumen may be cut-back asphalt, Grade RC-2 or RC-3; or emulsified asphalt, Grade AE-2 or AEM-2; with RC-2 and AE-2 being predominantly in use at the present time. The cover aggregate may be either sand or crushed gravel, stone or slag within our No. 11 or No. 12 grading, with No. 12 slag being the predominant aggregate on heavy traffic routes.

Natural sand Grade B grading is as follows:

Sieve Numbers and Percent Passing

3/8"	4	100	200
100	95-100	0-10	0-5

The aggregates for surfacing grading are as follows:

Sieve Sizes in Inches and Numbers and Percent Passing

No.	3/4"	½"	3/8"	4	8
11	100	95-100	...	5-25	0-5
12	...	100	95-100	10-40	0-10

The pavement to be sealed must be clean and dry at the time of application of the bitumen. The bitumen is applied by a pressure distributor at the rate of 0.20 to 0.30 gallon per square yard dependent upon type and condition of the bituminous concrete base and the type and grade of bitumen being applied. A typical rate of application on a sand asphalt pavement utilizing No. 12 slag aggregate for cover would be 0.20 gallon or RC-2 or 0.25 gallon of AE-2.

These relatively light application rates necessitate the use of distributors in perfect operating condition. Any nozzle streaking or pump pulsation will be reflected on the pavement with subsequent irregularities in the finished surface. Immediately following the bituminous application is the application of the cover aggregate. The aggregate is applied with a roll-type box spreader attached to the truck. This type of spreader is preferred since the predetermined rate of application is not affected by minor variations in truck speeds. As in the case of the bituminous material, the rate of application of the aggregate varies with the type and grade of asphalt and the amount applied. The average rate will be 20 to 25 pounds per square yard for crushed gravel and stone, and 16 to 20 pounds per square yard for slag.

Rolling Operation

Following the spreader is the roller or rollers. Specifications allow tandem or three-wheel rollers weighing from seven to ten tons or rubber tired rollers. Rubber tired rollers are required when sand is specified as cover aggregate. Tandem rollers in the eight-ton classification are normally used on slag treatments to prevent excessive aggregate crushing. Rolling is continued until the aggregate is well imbedded into the bitumen. With the completion of the rolling, the job is finished except for protection and careful attention during the curing period and early hours of traffic passage.

The time of curing as in the other phases of the operation is dependent upon a good many variables, such as temperature, humidity, and amount of moisture in the aggregate as well as type of bituminous material. Conditions permitting, we desire to keep traffic off the new treatment on heavy duty routes for twenty-four hours of favorable curing weather. However, on two-lane roads with low traffic counts, satisfactory results have been obtained when piloted traffic was placed on the treatment within two hours. The emulsions appear to cure somewhat faster than cut-backs under summer weather conditions, however, this does not remain true during the cool weather experienced during spring and fall.

It should be pointed out that, to secure best results, no general application rate of either type or grade of bitumen can be dictated, the same being true of the cover aggregate. Each job must be set up to take care of the conditions of roadway surface and traffic existing at the time of performance. With experienced supervision, a seal treatment of a bituminous concrete pavement can add many years of additional service at a minimum cost.

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The Editor, PUBLIC WORKS
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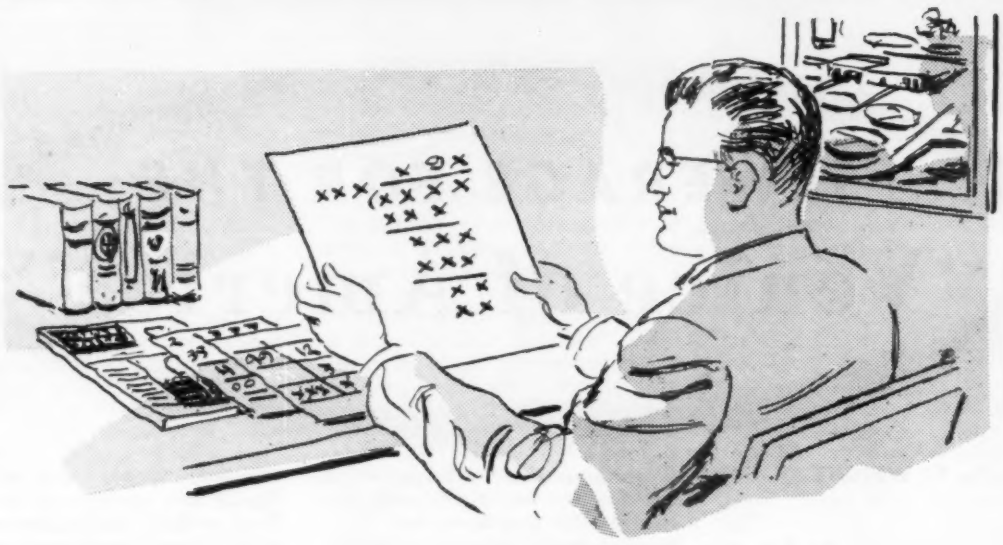


TIMEWASTERS

for These Long Winter Evenings

IN THE LONG-AGO PAST—that is the days before World War II—a special section of PUBLIC WORKS was devoted each month to "Timewasters" which were all that the name implied. Contributors to that column and solvers of it included some remarkably fine mathematicians. We have lost contact with many of them; perhaps these Timewasters will bring letters from the veterans of the pre-war era. The problems presented here are largely taken from files of the past, with a few new ones to add spice. Some are easy; some are very difficult; some are tricky, so beware. A few credits are given, but mostly time has eradicated authorship.

Number Problems

(1) A number ends in the figure "2". Move the "2" from the end to the beginning of the number. The number is now twice as great as the original number. What was the original number?

(2) The sum of two numbers is 22 and half the difference of the squares is 22. What are the numbers?

(3) Combine three 7's to make 20. Then combine four 3's—3, 3, 3 and 3, to get all numbers up to 25, using addition, multiplication or division as necessary.

(4) April 9, 1936, was reputed to be a perfect day: April, the fourth month, represented 2 squared; the 9th represented 3 squared; April 9 was the 100th day of the year, representing 10 squared; and 1936 is 44 squared. When will the next perfect day occur? And the next?

(5) There are four combinations of numbers which, when multiplied by 3 give in the multiplier, the multiplicand and the product all of the ten digits. What are these numbers?

(6) Here is a phantom division problem which can be worked out if you have the proper means, methods —and numbers:

```
          x7xxx
       ---------
xxx  | xxxxxxxx
       xxxx
       ----
        xxx
        xxx
        ---
        xxxx
         xxx
         ---
          xxxx
          xxxx
          ----
```

(7) Arrange the ten digits (0 through 9) to form numbers which will add up to 100, no more, no less, using each digit only once.

(8) Here is one that takes a little thinking:

$A + B + C + D = A \times B \times C \times D$

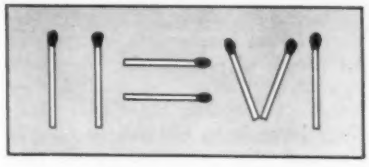
It can be solved; and all numbers are whole numbers.

(9) From a 3-digit number, subtract one-fourth of its value; the result is a 3-digit number containing the same three digits as you started with; from this second number, subtract again one-fourth of its value. The result is a number containing the same three digits that you started with. What is the number?

(10) What is the least number of cards necessary to form any number from 1 to 9999 if each card has one figure on the front and one figure on the back; and the figure 6 may be used for the figure 9 by placing the card upside down?

Inspection Problems

(11) Below are shown seven matches representing an equation which does not balance, as contributed by R. S. Rankin. Move one match and make the equation balance.



(12) Can you make three cuts and divide a pie into eight parts—not necessarily equal. Do not split the pie horizontally. Possibly your wife can help you on this but, if so, she will surely tell you it is an idiotic way to cut a pie.

(*Continued on page* 122)

SEWERAGE FOR THE "Venice of America"

C. E. WRIGHT

A FEW YEARS ago the City of Fort Lauderdale, Fla., one of the fastest growing communities in the United States, mapped out a long-range sewer program to cost an ultimate $22,000,000. The first stage, a $7,500,000 project, was to be financed by a general obligation bond issue, which under Florida law has to be approved by more than 50 percent of the registered freeholders. The referendum failed because less than 50 percent of the freeholders voted.

Only about 15 percent of the city is presently sewered. A chief objection to the original plan proposed was that the total money to be derived from the bond sale was to build treatment plants, force mains and pumping stations. No sewer connections would have been provided by this money. Thus, the entire credit of the city would have been pledged for facilities with no new contributors. Since it would have been difficult to sewer certain areas on an assessment basis, as was proposed, because of a large number of retirees and other modest income groups, the treatment plants would have operated for many years with only a portion of their design load actually connected, meanwhile burdening the general credit of the city.

On the other hand, a considerable part of Fort Lauderdale is populated by people of means who have built expensive homes and who wanted sewers to replace the septic tanks they have been obliged to use. In lieu of the original plan, the engineering firm of Philpott, Ross & Saarinen of Fort Lauderdale came up with an alternate to provide treatment plant facilities in increments as required by the collection system actually constructed. Naturally, the areas where sewers were requested are the areas being given first consideration. For this program, an issue of $11,000,000 of revenue certificates was sold late last year for both sewer and water extensions. Of this issue, $5,000,000 was for retirement of some existing bonds, leaving $6,000,000 for construction of sewer and water facilities.

It is the sewer program which presented the more intricate problems. In addition to the long-range planning required by rapid population growth, there were the added factors of Fort Lauderdale's unique location in an area permeated by 140 miles of canals (it is called the Venice of America) and of its vulnerability to hurricanes and flooding rains. There have been no hurricanes in recent years, but rains of hurricane intensity have caused flooding of septic tanks, with consequent dangers to health and comfort. Many of Fort Lauderdale's residential sections are on islands, which created a special problem. How the engineers solved it is a part of this story.

Growth of the City

As a preface to its engineering studies, Philpott, Ross & Saarinen had to make a study of population trends and estimated future population. During the 1940-50 decade Fort Lauderdale's population doubled from approximately 18,500 to 37,000. In the next five years it more than doubled again to an estimated 86,500. For the year 1965 it is estimated that the total permanent population will be 200,000. This estimate is borne out by separate studies made by the Southern Bell Telephone Co., the Florida Power & Light Co. and other service organizations which also have to plan for future growth.

An almost unpredictable factor was thrown into the situation by the launching a few years ago of the huge Coral Ridge development just north of the city. The land acquisition alone cost $19,000,000 and many times more than that will eventually be spent for residences, hotels and apartments. An ocean front section, locally known as the Galt Mile, will be a resort development whose potentialities can only be guessed at. So far only a 250-room hotel and a combination hotel and apartment building have been completed on the Galt Mile, but four other similar projects are in the planning stage; about 150 homes have been built of the several thousand that may eventually comprise a large residential area. This section has been annexed to the city by agreement between the owner, Coral Ridge Properties, Inc., and the city government.

Thus the sewering of Fort Lauderdale has many facets. For example, the sewage treatment plant for Area D, the southeastern section of the city, will have a first-stage capacity of 2,500,000 gpd, but its ultimate capacity will be 5,000,000 gpd. It will serve an area of 4,200 acres, about half of which is water and includes 25 islands. In what is known as Area B, the Coral Ridge section, a sewage treatment plant to be constructed in the middle of the Coral Ridge Country Club's golf course will have a first-stage capacity of 500,000 gpd and an ultimate capacity of 2,000,000 gpd.

The city's present collection system is more than 15 years old, some of it 20 years old. There is one treatment plant of the activated sludge type. Its design capacity is 3,500,000 gpd but it has been operated at higher rates. It has been redesigned for a capacity of 7,900,000 gpd. The effluent is discharged into the north fork of New River, which bisects Fort Lauderdale, at a point several hundred feet upstream from the West Broward Boulevard bridge, not far from the city center. The existing treatment plant serves mainly the downtown section of the city, designated as Area A. Area B includes outlying sections of the city which will be brought into the city proper when requested by the

residents. Area C will eventually be served by a treatment plant with ultimate capacity of 4,500,000 gpd. This will be built in stages later on when sewer construction for this area has been authorized. Area D, the beach area, on which work is going ahead, presented one of the most unique problems.

It is this beach section which consists largely of islands, peninsulas and water, with bridges connecting each piece of land with another. The preliminary work is basic construction. There are no sewer connections in this area. A large portion of the area was originally mangrove swamp and was low enough to be flooded at high tide. The mangrove growth was cut down but not removed before hydraulic fill was placed on top of it. This mangrove mat will be just about at the proposed sewer invert elevations. Sewer construction will be difficult to say the least.

Locally, this Venice-like area is known as the Las Olas finger islands and includes two sections, Harbor Beach and Harbor Heights, with high-priced homes whose residents were anxious to substitute sewers for septic tanks. Home laterals are assessed against the property, with monthly charges for service made a separate part of the water bill and based on water consumption, with a minimum of $2 a month. Monthly charges are made to the water user when the sewer service is made available whether or not the property owner actually connects to the system.

Collection System

A gravity collection system with pumping stations and force mains will serve 2,500 to 3,000 connections in this area, although all of it is not yet built up. The mains are laid in 10-ft. maximum cuts on land. There are to be 25 air ejector stations in the area, all operated from a central compressor station to lift the sewage up from below ground level over the bridge crossings and back to a gravity system. Compressed air is to be used instead of electric power as the area could be flooded if electric power failed. Any above-ground structure would be esthetically undesirable in such an area of high-priced homes.

Four different foundation types will be used for pipe beds. The type used will be dependent on the soil conditions at the proposed sewer invert elevation. If the trench bottom is in an area of stable material such as sand, the pipe will be laid in a bed of crushed ¼-in. limerock, locally known as "pea rock gravel." If stable material may be reached economically by extra excavation, this will be done and the trench will be backfilled with compacted sand or rock. Should it be uneconomical to excavate to stable material, the pipe will be laid in a bed of pea rock supported by a timber flooring with or without sheeting, depending upon the conditions of the sides of the trench. The engineers, realizing that vertical and lateral deflection may well occur to some degree, particularly in the latter type method of construction, have planned that all pipe shall be joined, using plasticized polyvinyl chloride compression type joint seals. These joint seals will permit deflection of several degrees while remaining bottle tight. In all cases manholes will be built on the same type foundation.

Both of the new treatment plants proposed will be high-rate trickling filter plants, with a recirculation ratio of 1. Digesters will be unheated but provision will be made to add this feature in the future. Final effluent will be discharged into the Intracoastal Waterway, which empties into the Atlantic Ocean at Port Everglades, just below Fort Lauderdale. The treatment plant at Coral Ridge will occupy a 10-acre tract in the center of the golf course. Coral Ridge Properties, Inc., was planning to build its own system and treatment plant, but when it agreed to annex the property to Fort Lauderdale it merged its plan with that of the city as a whole. The treatment plant at Port Everglades, serving Area D, will be constructed on special piling.

From 12 to 18 months will be required to complete the jobs that are presently outlined.

● **BEACH AREA of Fort Lauderdale has Venice-like canals separating homes on filled land. Twenty-five pneumatic ejector stations will be used to lift sewage flow over bridges and return it to the gravity system. Site of one new plant is shown; the existing plant is west of the business area; and another plant will be built at Coral Ridge, north of the city.**

Evaluation of URBAN INTERSECTION DESIGN

R. J. FURBECK,
Highway Engineer,
Illinois Dept. of Public Works and Buildings,
Division of Highways

INTERSECTION design is a facet of highway or street design toward which planning, location, design and traffic engineers are directing more and more of their attention in resolving their various engineering problems. This has been brought about by congested streets, parking problems, pedestrian interference, bottlenecks, snarled traffic, and a slow but relentless paralysis of street capacity.

Motorists are gaining a first hand knowledge of the consequence of inadequate intersection design as they painfully work their way car-by-car, stop-by-stop up to the intersection itself. This we know as congestion and it is something which many of our urban dwellers, especially those in our larger cities, have come to accept as a matter of course. However, the effect of congestion has a far-reaching mental and economic bearing upon the individual directly and to the community indirectly. The use of the motor vehicle is such a significant part of the social, commercial and industrial life of any community that the inability to move in a safe and efficient manner results in distress, inconvenience and economic loss. This is depicted so clearly when, during the so-called rush periods, normally nice people change into entirely different personages.

Yet few of us stop to ask the reason for congestion and fewer still are willing to pay the price to correct or alleviate it. This situation cannot well be blamed on a lack of foresight and planning. Rather, criticism is justified for our reluctance to forego the accepted principle of direct accessibility to the street by any and all proper users. If the public interest is to be served and their present and future highway investment safeguarded, it is high time that this archaic conception of accessibility be discarded and some form of roadside control instituted.

This condition is a consequence of community development and growth, as is demonstrated by the fact that the surburban-urban type of traffic has had the most rapid and sustained increase of all traffic categories. This encourages two kinds of roadside businesses—those catering to highway traffic and those serving the adjacent land development. As traffic increases, roadside businesses become more profitable and grow in numbers, thereby further increasing interference and hazard and lowering capacity. Intersections, because of their exposure to traffic, become focal points for commercialization. The inevitable result is that the street or highway becomes so choked with roadside interference, speed zones, signal lights and snarled traffic, together with a high accident frequency, that they can no longer handle the traffic load of which they were originally capable. Attempts to correct this deficiency by widening are prevented by the high values of abutting frontages.

The Solution

Urban traffic congestion can be relieved effectively only by a comprehensive plan in which the improvement of streets and allied facilities is but a single facet in the over-all plan. Improvements can be made by: 1) The construction of new arterial highways and the improvement of existing ones, particularly within the intersection areas; 2) the improvement of distributor streets; 3) the provision for and/or the improvement of existing facilities for parking and for loading zones; and 4) improvement in or creation of mass transit facilities, particularly in the larger cities.

For the past two decades engineers have been using a more scientific approach to the intersection problem by including in the design the outlines, features and facilities that tested conditions have indicated as desirable. These principles have been incorporated in the various publications of the AASHO and have been accepted as a logical basis of intersection design. However, the inclusion of various facilities into the design was determined by traffic volume warrants, and design was on the basis of traffic flow paths and did not always reflect the ability of traffic to utilize the facility as it was intended under actual operational conditions.

The recently developed "Highway Capacity Manual" and its subsequent adaptation in the form of graphic charts has now been added as a complement to the geometric design principles previously recognized and employed. By these methods one can determine the approach and exit widths necessary to accommodate, at a pre-established degree of operational freedom, the present or the anticipated future traffic flow pattern at an intersection.

The principle involved in this technique is the adjustment in basic capacity for varying roadway widths, truck percentages and volumes of through, turning and opposing traffic as well as for conditions of area type, parking restrictions and pedestrian interference. A reversal of the process will establish the roadway widths necessary to handle a specific volume of traffic. In like manner, the ability of a volume of turning vehicles to accomplish their maneuver in the face of an opposing volume of traffic can be evaluated, from which the need for additional facilities in the form of separate turning lanes or additional signal phases can be established.

Elements Controlling Design

These techniques are but working tools for the design engineer and provide information on but one facet of intersection design — the traffic and the adequacy of the geometric outlines. While it is essen-

tial that the intersection be designed to handle the anticipated traffic loads, there are other elements equally as important and these must be taken into account for they often have a vital bearing on the over-all design. While all are important, there are several which can be termed critical and an evaluation of all elements must be made to determine their individual and composite effects upon the design. These include such elements as safety, efficiency of operation, sufficiency of design, economics, adaptability and aesthetics, to name but a few.

Naturally a public agency must realize the largest return per dollar of investment, but it should be remembered that the motoring public is paying not only the taxes, but also the individual cost of operation upon the facility which his tax dollar has built.

All too often the consideration of safety, adequacy of geometric outlines and efficiency of operation are relegated to secondary consideration to the cost of construction. Economy is essential, but it should be carefully weighed against the accident potential of an insufficient and poorly designed intersection with all its consequences to the community welfare.

Data Evaluation and Type Selection

There are two general types of intersection—intersections at-grade and interchanges. The first is used at those locations where turning and cross movements can be handled adequately while the latter is employed for high hourly design volumes and heavy turning points. For several years engineers have been seeking to establish a traffic volume warrant so that they may say "above this volume we will provide for a separation of grades with interchange facilities and those with volumes below this level will be treated as at-grade intersections"; or "a volume of so many vehicles warrants channelization treatment or separate turning facilities." No such panacea has been determined and it is still necessary that a capacity analysis and an engineering evaluation be made to determine the type of intersection to be employed.

● **INTERSECTION and railroad crossing create conditions well and unfavorably known to many motorists. This problem in Jackson, Miss., has been corrected.**

There are various combinations of through, cross and turning volumes of traffic which the capacity analysis will indicate as being functionally inoperative, in which case it is obvious that a separation of grades with interchange facilities is necessary. It is also within the realms of possibility to develop an at-grade intersection design with a sufficient number of approach lanes and separate signal phases for turning movements to handle, capacitywise, most any traffic load. Such an arrangement and phasing may work from a theoretical standpoint, but in practical application such an intersection would bog down through sheer mass of paved area.

There is a feeling among some engineers that the installation of signal lights will provide the answer to a congested intersection condition, but signalization will not necessarily in itself increase the capacity of an overloaded intersection. It will, however, provide for an orderly and equalized flow of traffic through the intersection which will give a degree of relief. Signalizing might be considered as the last resort, short of a grade separation, to the handling of large volumes of traffic which, if not regulated, would create an intolerable condition.

At-grade intersections are either plain or will employ some degree of channelization for safety, operational control, or other purposes. Plain intersections are applicable where volumes of through traffic are moderate, turning movements are light, there are no physical restrictions and the accident experience is nil or of such infrequent occurrence that an accident pattern is not evident.

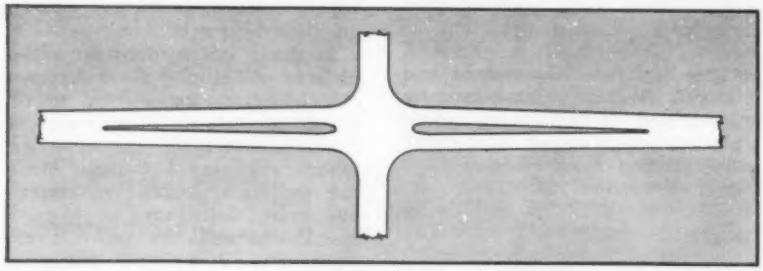
Channelization, in one form or another, is employed to separate conflict, reduce excessive areas, aid in the regulation or prohibition of specific movements, prohibit improper use of area, control speed, provide refuge for pedestrians and compensate for acute angles of conflict. It also gives shadow effect for visibility, provides for heavy directional movements, and is a location for traffic control devices and a reference point for vehicular flow paths. Its use is almost mandatory in modern design but, by the same token, location and detailed design are equally important.

On an ordinary two-way city street the channelizing median warns approaching drivers of the presence of an intersection where turning movements can be expected and it also separates opposing streams of traffic. Extra intersection capacity is likewise provided.

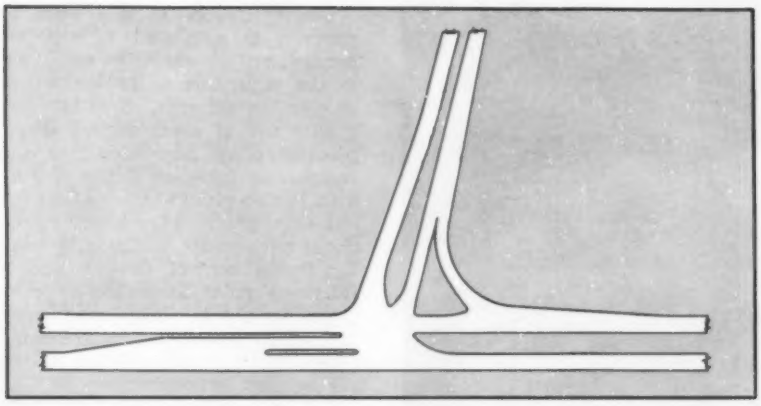
The geometric control dimensions, facilities and arrangement of design features incorporated into a design tell, or should tell, the complete background of factual data and the elements controlling the design. An intersection design employing a divisional median on both streets and added turning facilities indicates that both are major high-volume streets, otherwise there would be no need for the multi-lane development and the divisional channelization. The presence of the protecting channelization for the median left turn lane indicates the potential of rear-end and side-swipe type accidents. The right turning movement is of sufficient magnitude and importance as to warrant provision for continuous

operation. The presence of the merging area on the exit roadway substantiates this contention and further indicates the presence of signalization.

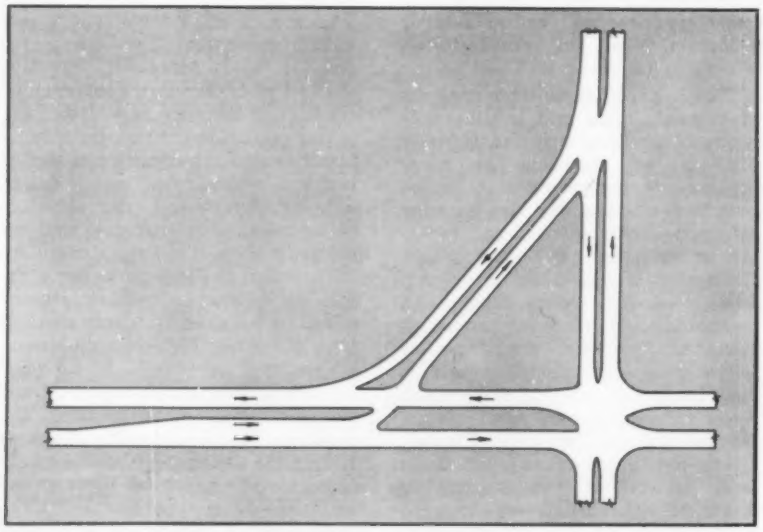
There are often locations where the volumes of traffic arriving on one or more approaches during the red and amber light phases exceed the ability to clear the intersection during the green time apportioned to that particular approach or to the turning movement. In many instances physical limitations and restrictions or widespread property damage or both makes it impossible or economically impractical to develop a separation of grades with adequate interchange facilities. The congestion at such locations is often caused by an abnormally large left turning movement and its complement, such as occurs when a marked highway route makes a right angled change in direction. A solution to such a situation is the removal of the heavy left turning movement from the main point of intersection by providing a separate diagonal roadway and creating two additional intersections. A high degree of efficiency can be obtained by a system of progressively synchronized signals effected by a proper signal timing in relation to the distance and pavement widths between the three points of conflict. Where movements in other quadrants reach the proportion of through movements, additional diagonal roadways might be provided to advantage.



● **INTERSECTIONS at grade usually employ a degree of channelization for safety.**



● **CHANNELIZED intersection of high type for multi-lane high-volume streets.**



● **DIVISIONAL median on both streets and added turning facilities, with protection against rear-end and side swipe accidents by protective channelization facilities.**

Grade separations and interchanges are used in urban areas mainly on major freeway developments or to relieve traffic bottlenecks at isolated locations or correct existing hazardous conditions. A more general use is precluded because of the high initial cost and the fact that they require rather extensive land areas. An enumeration of the specific conditions or warrants justifying an interchange at a given intersection is difficult and, in some instances, cannot be conclusively stated. The conditions that should be considered to reach a rational decision are generally accepted to be as follows:

1) Type of development—Major arterial freeway developments with access control between selected termini become the warrants for providing grade separation or interchanges for all or at least the important intersecting streets. Under full access control development, the individual warrant for a separation or interchange is absorbed in the decision to develop the freeway. 2) Elimination of bottlenecks or spot congestion—The inability to provide essential capacity with an at-grade facility provides the warrant for an interchange. 3) Elimination of hazard. 4) Site topography. 5) Road user benefits—Costs of fuel, tires, oil, repairs, time, accidents, etc., at intersections that require speed changes, stops, and waiting are well in excess of those for intersections permitting uninterrupted or continuous operation. 6) Traffic volume warrants—While a specific volume of traffic at an intersection cannot be completely rationalized as a warrant for an interchange, it is an important guide, particularly when combined with the traffic distribution pattern and the effect on traffic behavior.

The interchange type is designated in terms of the indicated ramp pattern, such as the trumpet or 'jug handles', the Y or directional; the

cloverleaf; the diamond; and the rotary. Any other development is either a modification of or a combination of the various design principles of these types. All serve a definite need and an evaluation of the factual data must be made to determine the type to be used.

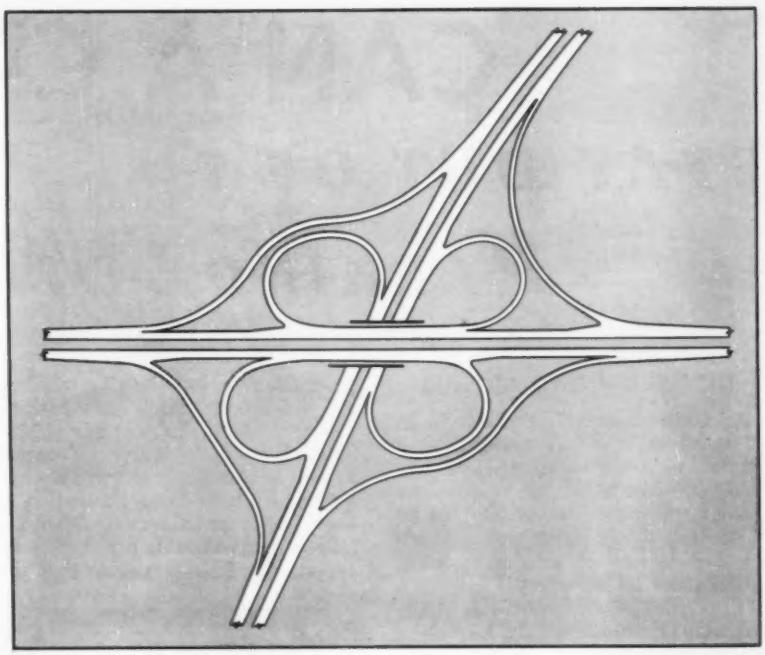
The cloverleaf, or derivations thereof, will handle very large volumes of through and turning movements with continuous operation at reasonable speeds on both intersecting streets. The distinguishing feature is that left turns are not possible, such movements being accomplished beyond the point of through road interference by making an angle of turn to the right of about 270°.

The diamond interchange has four one-way ramps and is especially adaptable to major-minor street intersections with limited right-of-way. The ramps are usually elongated along the preference street to facilitate a high speed departure with a small angle of turn and may be curved or parallel thereto. The nonpreference road terminal of each ramp is a T or Y at-grade intersection that has one left and one right turning movement. The acceptability of this type interchange is dependent upon the ability to make left turns on the nonpreference street at the ramp terminals which may or may not be signalized. Normally the interchange movements are relatively light.

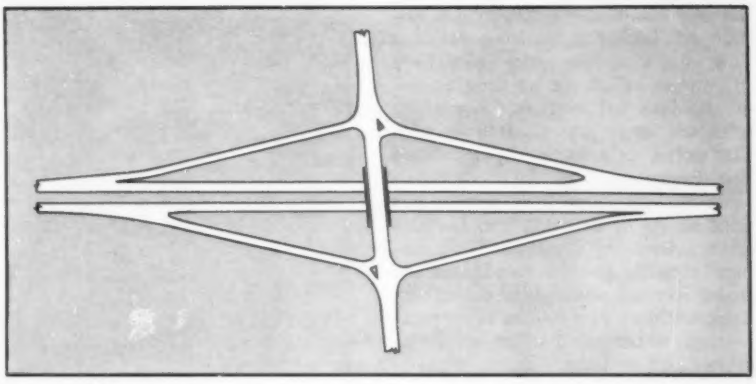
Another well known type is the partial cloverleaf in which all movements are provided for, but left turns at grade are required on the nonpreference street. This type is particularly adaptable where terrain, physical features or economic considerations preclude a full complement of ramps. Other reasons for a partial cloverleaf design are a stage development or the omission of a turning movement and its complement.

The preceding discussions show that, even after we have ascertained the geometric control dimensions and facilities necessary to accommodate the traffic volumes, an evaluation of the factual and physical data is still indispensable to the selection of the proper type of intersection treatment. Experience has proven that various restrictions to sufficient minimum standards of design must be compensated for by the inclusion of specific facilities and features of design and that the proper arrangement of these is necessary to realize safety and efficiency of operation.

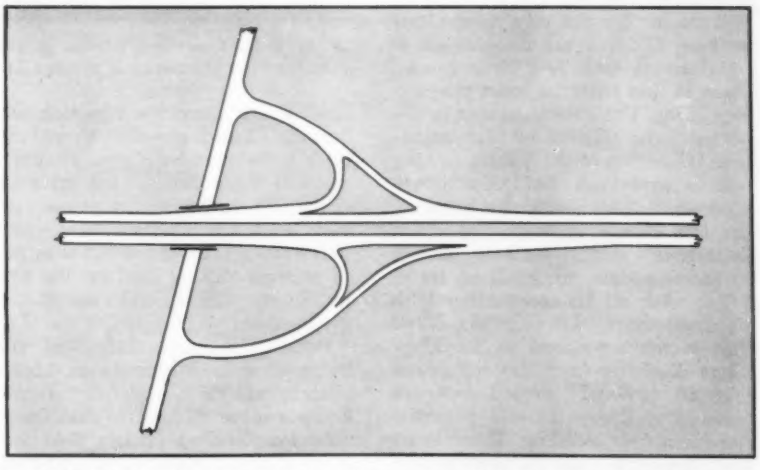
(*Continued on page* 178)



● **CLOVERLEAF interchange prevents left turns and will handle large traffic flows.**



● **DIAMOND interchange is especially adapted to major-minor street intersections.**



● **PARTIAL cloverleaf provides for all movements but left turns at grade are required on the non-preference street. This may be used as a stage development.**

CAN A CITY STAY OUT OF THE PARKING LOT BUSINESS?

GUY BROWNING ARTHUR

A CITY should, Greensboro, N. C., thinks, maintain meters on the streets to divide parking time equitably between all users, because the streets belong to the public. To go beyond this, and risk public funds in the domain of gainful business, should not be necessary.

Nevertheless Greensboro is in the parking lot business. It has eight municipal lots in the busiest downtown section. From the time the first meters were installed on the streets the city has had a policy which developed into the parking lot era with one aim: To make sure there is enough off-street parking to accommodate all comers, expanding with the city's growth. It lives with that policy in a spirit of enlightened public service.

So far the supply of spaces has kept ahead of demand, and the city government is determined to expand steadily to stay ahead. Lots are to be located within the downtown area, within a few blocks of concentrations of use; near office buildings, stores and services.

Modern Devices Needed

Whether the lots are operated by citizens, or by the city, is not important. Citizens are encouraged to build more lots, and to construct them in line with the most progressive ideas. Their management is expected to be efficient by high standards of service to the public, so they will attract and hold customers. Modern devices should be installed, the lots should be kept clean, and their hours should be long enough to accommodate all kinds of trade.

Yet with all its cooperation with citizen owners, the city has found that it must proceed in its long-range planning from the conviction that all privately owned lots are temporary. Every lot is a potential site for a new building. There is no assurance that even the most profitable private lot will not be sold for that purpose. The owner may profit from the sale, but the city will lose an important block of parking spaces. Nothing can be done to hinder this, for any owner has the right to make a profit on his investment.

The city now has a population of over 75,000, on an area of 22 square miles. It grows steadily and conservatively. It is inevitable that the land in the down-town section will become more valuable. There will have to be more buildings. That will make it more difficult for privately operated lots to earn a proper return on their investments. Owners will have more opportunities to sell to persons seeking land for the new buildings. There will be higher profits from such sales.

Lots which lease their land will be faced with shorter leases, higher rentals, and more insecurity. It will become more difficult to find desirable locations at rentals that will leave a profit. New renters will cut their own investments to lower figures, possibly with the effect of making their lots less attractive than they could be. If they operate with attendants, the steady rise in wages and all other costs will increasingly deter them from paying higher rentals, and the lots will go out of business.

The city has to face this: the transitory nature of such private enterprise. Ordinarily a city might shrug it off, but Greensboro does not. Parking off the street is a demanding problem which will not grow less. A total number of spaces, higher than demand, must be provided and maintained in the congested downtown section by someone—the city or private interests. The problem is not which interest; it belongs, as a whole, to the community. The community wants to park its cars near its destinations.

What the city hopes the citizen-owners will do is to evolve their surface lots into 2-story, 3-story and even 4-story garages. By thus increasing the revenue from the same

● **MONTHLY parking lot has electronically controlled entrance and exit gates. Punched monthly ticket is entered in box to open gate. Exit is by same method.**

surface area the lots should be able to stay in business, increasing the space as the demand grows. To financing institutions this may be as attractive as any other development of the property, providing the rising investment is kept within sound ratio to expected return. The return must be at least equal to that which could be expected from any other development.

Garages Are Next Step

If these lots do not develop with the demand, and especially if they are sold to be sites for new buildings, the city will be forced to build garages on its surface lots. This is a long step from the basic policy that the city would rather be out of the parking lot business, but it may become unavoidable.

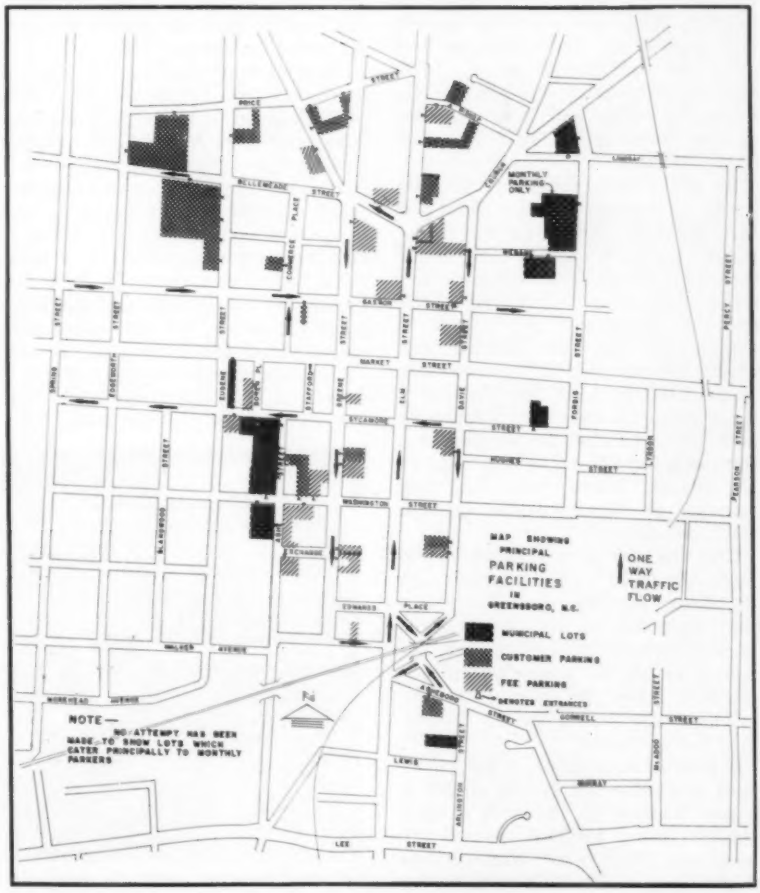
It is plain that the city cannot stay out of the business. Parking must be provided, and privately owned and operated help is too uncertain. The hope that it could stay out, or at least stabilize and pace the business with a few municipal lots, went out the window with the first venture. Private business is operated for profit; the responsibility of city officials is for service to the public. While the two can cooperate along the lines of service, they part with little ceremony when profit looms into view. Therefore the city cannot plan long-range parking programs with very much dependence upon private-capital help.

When the city policy was set up, with the installation of the first meters, in 1945, it was determined that all revenue from the meters would go into a fund for the relief of traffic congestion. Greensboro is an open city, with wide streets, and in 1945 no one was thinking beyond equitable rationing of curb space. At that time scarcely anyone thought how the meter fund might have to be spent. As curb space became inadequate, the first parking lots came into existence here and there; merely empty lots in which cars could be left for hours or all day for a small fee.

The first municipal lot was built in 1949, with 53 spaces. Then in 1953 a traffic survey was made by W. F. Babcock, then teaching traffic engineering at the State University. He has recently been appointed Director of the State Highway Department. His survey proved that planning for future parking space would have to move much faster to keep ahead of demand.

As more city-owned lots were opened the basic policy began to show its worth. It was fair to everyone. No new lot was built without making a thorough survey of supply and demand in the area, consulting with all private operators who would be affected. Rates have always been established in line with those being

● **ELECTRONIC gate is operated by treadle over which car passes. It delivers a ticket with entering hour marked so that a proper charge can be made on leaving. The car leaves on the other side of the booth where an attendant collects the fee.**


MAP SHOWING PRINCIPAL PARKING FACILITIES IN GREENSBORO, N.C.
ONE WAY TRAFFIC FLOW
MUNICIPAL LOTS
CUSTOMER PARKING
FEE PARKING
REMOTE ENTRANCES
NOTE— NO ATTEMPT HAS BEEN MADE TO SHOW LOTS WHICH CATER PRINCIPALLY TO MONTHLY PARKERS
MONTHLY PARKING ONLY

● **MAP of downtown Greensboro shows municipal lots and free and customer parking.**

charged in nearby lots, sometimes modified by conditions, and by the nature and quality of service.

Citizen-owned lots have never had to fear the competition of the city. City-owned lots have done more to build business than those already operating in an area. As more space has been provided in a block, more cars came—often more than the new lot would accommodate—and more trade went to the lots nearby.

The city checks frequently on the occupancy percentage of all lots to see how the demand in any area—and in the city as a whole—grows, and this is a steadying guide in planning more space. This checking is done at various times in the day or week, but particularly during peak hours. This is one business in which maximum figures are the indicators. The requirement is space for all the cars that want to get in. If the lots are nearly empty in low-demand periods, that is not too important.

Design of Lots and Spaces

A lasting impression of the city-owned lots is that they are good to look at. They are smoothly paved, and kept clean. The entrances and exits are wide enough to permit of easy maneuvering. Car spaces are unusually wide and long and the parting lines are double, to make plenty of room for opening car doors.

In the monthly parking lot the holder of the space has his name and card number painted on the pavement so that it can be seen under the rear bumper. Trespassers are treated just as any other trespassers, and with dispatch.

To show how the demand has grown for parking, 277 spaces have been added to Ashe Lot Number 1 since 1949. Of this total 75 spaces were added in 1956. Today there are eight municipal lots, with a total of 822 spaces. Three more lots are planned, at this point, to provide 143 more spaces.

Like the lots privately owned, the city's first ones were operated with attendants. Now there is an interesting departure in two lots where "ticket spitters" and gates are installed. In one lot where an attendant still takes the money on the exit side, the "ticket spitter" polices only the entrance.

A treadle is installed in the pavement alongside the booth. Above a square housing on the curb a little box-like snout projects toward the pavement. When a car enters it depresses the treadle. This actuates the electronic device in the housing, and a yellow ticket, two inches by four, is thrust out through the snout to the driver. On the card is stamped his entering time. He pockets it and finds a place in the lot.

When he leaves he drives out on the other side of the booth and presents his ticket to the attendant in the usual way. It is run through a time-stamping machine and the attendant makes the computation and collects the fee. This is one of the largest lots, and the treadle makes many contacts, continuously at peak hours.

The system goes a step farther in the monthly parking lot. There is no attendant here, and the entrance and exit gates are controlled electronically. An applicant for space pays five dollars for a monthly ticket. It has his name printed, and a code number punched through. When he enters the lot he drives close to the little projecting box, and slips his card into the snout. By electronic contacts the gate which bars his way is lifted, and he drives through.

On leaving he does the same thing. When he inserts his card in the box the gate swings up and he drives through. The gates close automatically after each car passes through, actuated by electric eyes.

The devices used in the lots are manufactured by Automatic Parking Devices, Inc. and the Parking Corporation of America. The system has now been extended to have two gates, one in front, the other behind, each car. No car can barge in, and none can get out except between the two gates operated by a card. The device automatically locks up when the lot is full, and no more cars can enter. An anti-panic gate is provided for release of all cars in an emergency.

All of the eight municipal lots have been built with the meter fund. The fund is now increasing more rapidly with revenues from the parking lots, and is expected to provide all money required for expansions up to a point where the city may have to build garages on their surface space. Then a Parking Commission will be appointed, with power to issue revenue bonds to cover costs.

Income and Expenditures

At the present time income for the fund, from parking lots and meters, is about $115,000 a year. This year about $82,600 is being spent for new lots and additions to existing lots.

The lots have cost an average of $800 per car space, varying from $1100 down to $500. This includes all work; clearing, leveling, paving, electronic gates and meters. The revenue averages about $70 per space per year, ranging from $110 down to $50.

The saving in the use of the electronic devices is not separated, but it must be considerable. Salaries for attendants would be the biggest item, but there might be uniforms to consider, and several minor items. The salary item alone at a big lot, in a town the size of Greensboro, might be as much as $4,000.

For the monthly parking lot the electronic gate cost $1,000. At the other lot, where an attendant takes the tickets, the complete installation cost $3,750. It could have been rented at $125 per month.

The man behind this parking lot business has been City Manager J. R. Townsend, and he has been aided by Col. L. L. Bingham, his Administrative Assistant. To them the parking lot is essentially private enterprise, but they accept the compelling forces that project the city into the business.

● **CAR parking spaces are unusually long and wide to care for modern oversize automobiles. The double parking lines insure room enough to open automobile doors.**

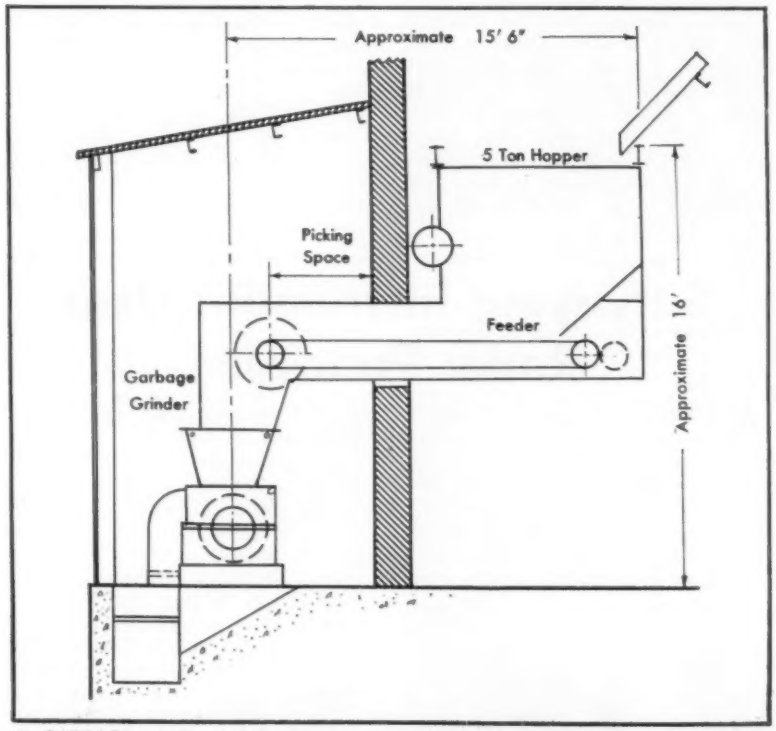
MAKING COLUMBUS GARBAGE FREE

HARRY R. PATTERSON,
Assistant Director,
Department of Public Service,
Columbus, Ohio

CREDIT Columbus, Ohio, with forging ahead toward a garbageless city by adopting improved methods of garbage disposal. Recently two important steps were made to improve sanitary conditions and to make Columbus garbage free: 1) By passing legislation making mandatory the installation of garbage disposers in all new dwellings, restaurants and eating places having kitchens; 2) by installing a 10-ton per hour pilot plant for garbage grinding at the present central incinerator to handle wet garbage from downtown restaurants along with fruit and vegetable refuse from the municipal Central Market.

Thus in new residential areas there will be no need for garbage cans or garbage collection. Rodent and fly breeding places will be eliminated. The new garbage grinder plant at the central incinerator provided an inexpensive way for disposing of excess wet garbage without creating any nuisance. Added incinerator capacity was created for burning drier garbage and refuse without the use of auxiliary fuel.

We recognized that for over twenty years there has been a definite trend toward garbage grinding. Cities have used garbage grinders because they proved reliable, economical and efficient. The product is water borne in sewers; there is no air contamination. During the last war many garbage grinders were manufactured in Columbus for use on shipboard. Disposal was so complete that sea birds found no food in the wake of the ships. So no sea birds followed these ships to give visible evidence of the ship's presence to distant enemy craft. Yearly sales of home garbage disposers increased from 100,000 in 1947 to 360,000 in 1954. In this country at present over 2,000,000 household food waste disposers are in use, representing about 5 percent of the total number of homes wired for electricity.



● **GARBAGE grinder installation for wet garbage from restaurants and markets.**

Home Disposers

Before any legislation was drawn up requiring the use of home disposers an investigation was made to determine the experiences of other communities. In March, 1950, Jasper, Indiana, required the installation of disposers throughout the city. Herrin, Illinois, followed Jasper, as did Shorewood, Wisconsin; South Euclid, Ohio; and Mount Dora, Florida. Other cities required grinders in all new homes. These included Oak Park, Royal Oak, Allen Park and Dearborn, Michigan; Beverly Hills and Pomona, California; and Aurora, Colorado.

Jasper, Indiana, now has about 1,000 grinders in use; practically all new houses have them. According to Edward T. Seng, superintendent of sewers, the sewers have given no trouble. He attributes this to the ground bones and other roughage in the garbage that tends to scrub out the grease and other foreign matter. Air requirements for the sewage treatment plant were higher but gas production was nearly doubled. Sludge disposal was no problem. The sludge is sold direct from the drying beds as fertilizer at $2.50 per pickup truck as fast as it is available.

Accordingly Columbus passed legislation governing the installation of home garbage grinders and incinerators. Typical provisions were made as follows:

1) To provide disposers in all dwellings and all other type structures, containing kitchens, constructed hereafter.

2) That the equipment will operate with water flowing into the grinder and through the sink drainline.

3) That the equipment shall discharge wastes at a reasonably uniform rate, in fluid form, which shall flow readily through an approved trap, drainline or soil line in a manner which will prevent clogging or stoppage of the drainline.

4) That the equipment shall be of such construction and have such operation and characteristics that at least 40 percent of all material discharged from it shall pass a No. 8 sieve; at least 65 percent shall pass a No. 3 sieve; and 100 percent shall pass a ½-inch screen.

5) That the equipment shall be self scouring, with no fouling sur-

faces to cause objectionable odors.

6) That the equipment shall be free from electrical or mechanical hazards.

7) That the equipment shall be connected to the drain in full conformity with the provisions of the plumbing code and shall be free of any cross-connections.

8) The final decision as to the sufficiency of the designs to meet these requirements shall rest with the City Building Department.

It has been predicted that not just garbage, but rubbish and refuse of all sorts will be flushed down the drain. A study of refuse disposal problems was made by Albert Bush, Stewart Mulford and Edwin Bowler at the University of California at Los Angeles. Mr. Bush stated, "Garbage grinders have made considerable inroads into the garbage disposal problem. . . . With further developments in the use of water transport, we may be able to get rid of other household rubbish in a similar manner."

Municipal Disposal

Planning for our Columbus pilot garbage grinding plant began in earnest when an appropriation of $12,000 was made. Investigations revealed that for over two decades garbage grinding plants had been built. They were of two types. At Lansing, Michigan, ground garbage was added directly to the sewage plant digester; at Findlay, Ohio, and Marion, Indiana, ground garbage was added to raw sewage ahead of the treatment plant.

More recently the city of Detroit finished an experimental garbage grinding station costing $185,000. The capacity was 250 of the city's daily 1500 tons of garbage. Residue is flushed into the sewer system. The use of grinding plants is calculated to release the municipal incinerators from garbage to burn more rubbish. Savings will result in shorter hauls; rubbish is now hauled 20 miles outside the city. In Washington, D. C., a modern transfer station for handling garbage and refuse was built only a few thousand feet from the capitol. Here two Jeffrey garbage grinders of 10 and 20 tons per hour each are used to dispose of surplus garbage.

For Columbus, the pilot garbage grinding plant was laid out with a capacity of 100 tons per day for the contemplated 10-hour operation. The plant was added to the present Short Street Incinerator, using the present crane. A 5-ton storage hopper has a 36-in. live bottom, steel apron conveyor. The conveyor feeds material past a picker who removes tin cans, bottles, scrap iron and other inorganic solids. A 10-ton per hour Jeffrey grinder discharges ground garbage slurry into the sewer. An insulated, corrugated aluminum housing was provided. All floors are of concrete or metal grating with provisions for washing so there will be no odors.

The plant was started in June, 1956, and operated through the summer months. At first there were frequent shutdowns due to stoppage of an old sewer. A new 10-in. branch line about 100 feet long on 4 percent was constructed to the main interceptor sewer; an additional water service line was also laid. The plant now handles the materials for which it was built, wet garbage from restaurants and vegetable and fruit waste from Central Market, except loads of feathers and banana stalks. However when wrapped garbage from home collections was ground, more than 60 gpm. of water was needed to move the light, water-absorbing, pulpy slurry down the branch sewer. More water was also needed to move grit estimated to be about 40 lbs. per ton of garbage.

Advantages

Here in Columbus we enjoy this age of pure foods, potable water, clear air, and clean streets and alleys. Now we are planning and working to become garbage free. This revolution was made possible with the development of the garbage grinder. Garbage grinding offers an economical method to handle and treat municipal garbage with sewage. The slurry produced is a mixture of water and sewage, easily transported underground, and it responds to treatment and digestion along with sewage.

In the light of our experiences and public acceptance of home garbage disposal, it is safe to forecast that improved grinding techniques of a few years hence will satisfy the people's demands for odor free, sanitary disposal of home garbage and refuse. Garbage grinding is helping to make Columbus garbage free by doing away with garbage cans, garbage collection, odors, and rodent and fly breeding places. This revolution in improved methods uses existing sewers and sewage treatment plants to produce useful gas and farm fertilizer.

Surveying Instrument Uses Radar Principles

A NEW, highly exact mapping instrument measured distances of 27,414 feet within four inches at recent tests near Doylestown, Pa. The instrument is the Tellurometer, an electronic tool developed in South Africa which operates on radar principles. It is expected to cut basic ground mapping costs and time by 75 percent or more.

● ON THIS test demonstration of the Tellurometer, a distance of over 5 miles was measured with a ±4-inch error.

The tests were performed by field survey personnel of Aero Service Corp., Philadelphia, a worldwide mapping company that has purchased several Tellurometers for use in its extensive survey operations. They will provide the necessary ground measurements on air surveys for highways, railroads, pipe lines and other large scale developments.

The new instrument measures distance by phase comparison. A 10 megacycle crystal oscillator in the "master" instrument transmits a pulse, which is compared with a pulse from a similar oscillator in the "remote" station. The remote station transmits 1,000 cycles above or below the 10 megacycle wave length. Rain or fog, daylight or dark do not affect the operation of the Tellurometer.

Aero will use the instrument for measurements ranging from one-half mile to 30 miles or more. On one recent test, over a 42,327 ft. distance, the Tellurometer proved to be accurate up to 1 part in 300,000.

ELECTRICAL SUPERVISORY CONTROLS CHECK WATER SYSTEM

MARVIN H. SCHROEDER,
Director of Utilities,
Vancouver, Washington

VANCOUVER, which celebrated in 1957 its 100th birthday and its 20th year of municipal water works operation, obtains its water supply from springs and wells. From Ellsworth Springs, five miles east, the city gets 2.0 to 2.7 mgd; the remainder is pumped from 14 wells which deliver up to 25.9 mgd. These wells are 186 to 287 ft. deep and are equipped with turbine pumps driven by 100 and 150-hp electric motors. There are also six auxiliary gas driven engines which can furnish power to four of the deep well turbines and to two of the booster pumps in case of power failure.

Four ground level reservoirs of 14.8 mg capacity and four elevated tanks of 1.3 mg capacity provide storage. Due to the terrain, about one-third of the water must be pumped to elevated tanks. The area served is considerable and checking reservoir levels required a great deal of manpower in the past. Consequently, when the author became Director of Utilities five years ago, it was determined after a study of the situation, to install a completely automatic system with controls located at one central station. The local conditions indicated that control units furnished by the Service Control Co., Portland, were best suited to the city's needs.

The system requires no radio tubes, electronics or radio frequencies; positive application is used to each pump. The transmitter, receiver and recorder are all in one separate circuit; thus a power line failure does not affect the controls and records of the rest of the system. Each system has its own alarm and red light indicator under the recorder for quick location of trouble. A test button on each system is also available at the main station to check all equipment at all other stations. Each well pump has a metered timer to show running time and gallons of water pumped.

These controls will automatically permit the use of all gravity flow spring water before the deep well turbines are started. In case of complete power failure, protection is provided with a battery hookup for alarms. There is also available a secondary source of electric power.

Before the installation of this equipment we had five men checking reservoirs and pumping stations; today one man performs these duties as well as repairing meters and checking the control panel. He can tell at a glance the water levels in all reservoirs and tower tanks, how many pumps are in operation and which one is on the line.

The equipment includes a transmitter which operates from the reservoirs, controls all pumps, transmits the water level signal to the main station and also operates the recorder at the main station. The water levels can be read at all times. The receiver at the pump house is synchronized with the timer at the transmitter. Trouble at the receiver is transmitted to the main control panel by a 5-second alarm every 60 seconds; trouble at the transmitter causes a continuous alarm, to facilitate location of the source.

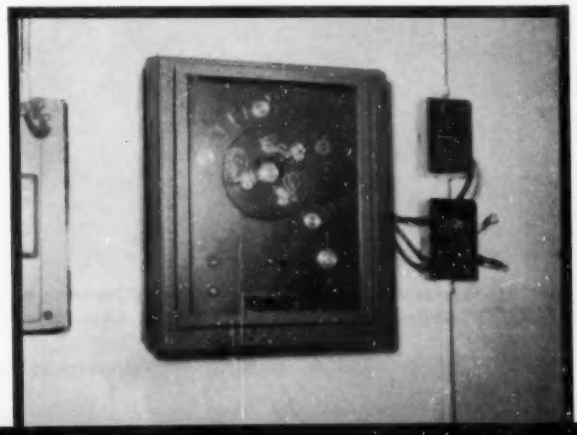
A plug-in arrangement permits pumps to be alternated, an especially desirable feature during low water use seasons. Changing of pump operation is done at the main control panel.

The delay relay protects equipment from becoming damaged. If a power failure occurs, this relay will not permit the pumps which were on line at the time of power failure to come back on line immediately. Deep well turbines will have time to go through a back spin, if not of the ratchet type, and then come on the line fifteen to twenty minutes apart or at any desired time setting.

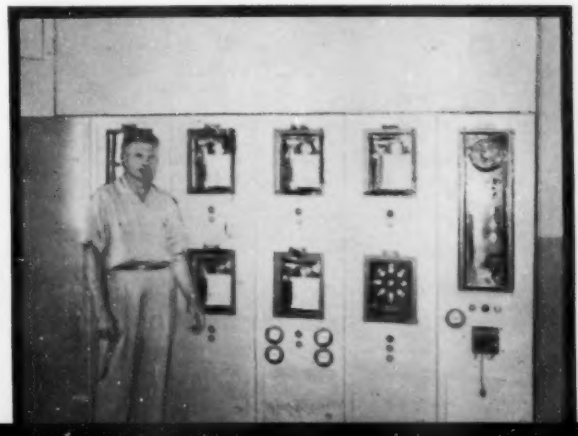
Recordings are made of water levels at reservoirs, the number of pumps in running position, which pump is in operation and trouble, if any, and its location. Provisions are also available to start and stop pumps manually at well and booster locations throughout the entire water system, as well as to operate them automatically. This feature permits us to test our pumps at any time, day or night.

From our experience a full reservoir is getting all the return for its capital investment; and it permits working more personnel on essential jobs rather than making calls to see if reservoirs are full and pumps are operating. Over the past four years, these controls have more than paid for themselves.

● **RECEIVER at pump house is always in synchronization with timer at transmitter to determine and locate trouble promptly.**



● **MAIN control panel is in charge of operations after 11 p.m. In case of trouble it rings alarm in home of serviceman.**



Rubberized Playground Surface Gives

BOUNCE Instead of BUMP

THOMAS A. JOHNSON,
Research Chemist,
U. S. Rubber Reclaiming Co., Inc.

● **PLAY AREA has resilient rubberized surface which reduces the hazard of falls.**

THE DAY of the little red school house with its grass or dirt playground has passed. The grass or dirt play areas often have been replaced by hard, abrasive surfaces, and the accident rate from children being hurt in falls on such hard surfaces has become an increasing problem for municipal and school playground directors.

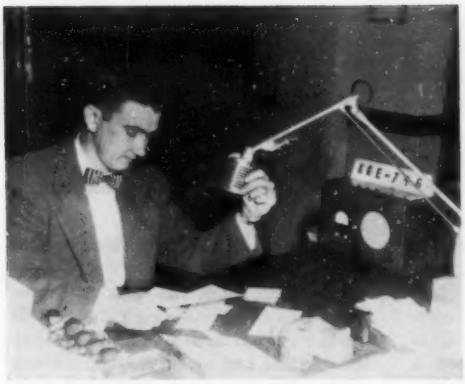
Development of a new surfacing material which would minimize or do away with the painful cuts, bruises and abrasions children suffer in falls, has been accomplished by research engineers of U. S. Rubber Reclaiming Co. In August, 1954, one of the first installations of "SAF-PLA" was in a driveway in Hamburg, New York. Since 1954, SAF-PLA has been installed in many municipal and school playgrounds. It is a pre-treated rubber crumb mixed with asphalt which makes a good looking, resilient and protective mat suitable for a variety of play areas.

This material should be applied only on a base which is well drained and well compacted, with the surface dry and free from excessive cracks and splits. An existing base should be strong enough to stand repeated rolling by a 3 to 5-ton roller without movement. Broken or irregular surfaces should be leveled with a course of black top. Concrete or smooth bituminous concrete pavement are ideal base surfaces. However, if no firm base surface exists, a penetration base may be used with equally good results. To prepare this, the area is excavated 4 inches from finished grade, allowing for proper drainage; stone or slag is placed and rolled. One gallon of 70 B-grade asphalt emulsion per square yard should be applied; the last coat of emulsion should cure about 24 hours before applying the rubberized surfacing.

SAF-PLA should be applied by a contractor. The vehicles used are a small mortar or concrete mixer to mix the treated rubber crumb with cutback asphalt (usually RC-1); a 3 to 5-ton roller; wheel barrows; rakes; and brooms. After the mixing operation, the compound is raked onto the base surface to which a tack coat (usually RC-2) has been applied. Before rolling the material into place, it should be allowed to cure; three or four hours may be required before rolling. Weather conditions at the time of application will determine the curing time. The roller should be kept clean and continuously wet with water. The finely granulated surfacing material should be applied after the first rolling. Best results are obtained by sifting or brushing the surface material into the exposed voids of the SAF-PLA. While the surface is being rolled for the second time, the surfacing material should be broomed until it is well incorporated. This gives the final surface a closer texture and also protects it from scuffing while the surface is curing. The time allowed for final curing before the area can be used for playing will depend largely on the weather. One week or more may be necessary.

● **"SAF-PLA," a pre-treated rubber crumb mixed with cutback asphalt is raked onto the base surface of playground.**

● **CLOSE texture of the surface is formed by brooming on additional finely granulated material and a final rolling.**



● REMOTE control unit in downtown office sends notices of shutoffs, line breaks, etc., to field men.

● UPON arriving at a job to which he has been sent, serviceman calls "C-1, 10-7" to get last-minute instructions before he leaves his vehicle.

TWO-WAY RADIO COMMUNICATION BOOSTS SERVICE 50 PERCENT

WALTER RUDOLPH

THE SHENANGO Valley, which had a population of 56,492 in 1950, includes communities such as Sharon, Farrell, Hickory Township, in Pennsylvania, and Wheatland, across the line, in Ohio. Thousands of new homes have been built in this area since the above census figures were released. This places an above average new service burden upon Shenango Valley Water Co., which listed some 14,660 customers last year.

"But we're keeping better than an even pace with service requirements, with little or no increase in working personnel," reported engineer Wm. E. Link. "Two-way radio does the payroll shrinking for us. We've cut contact time with field workers down to seconds as against minutes or even hours, before two-way radio.

"This means we save unnecessary field moves, place servicemen and trucks quickly where they are needed," continued Mr. Link. "We get better, or as they say more efficient, use of our men and equipment."

Mr. Link estimated that service time, the interval from the receipt of a complaint or notice of a need in the field to the time action was under way, was cut at least 50 percent — sometimes hours down to minutes. This means happier, more pleased water customers, less overtime for field workers, and greater savings for the water utility. There are other benefits accruing from two-way radio communication, dependent upon potential crises, none of which are desired but which are contingent upon the times.

"We feel that, in cases of emergency, disaster, floods or other hazards, this Motorola two-way radio communication will be priceless. The water utility's role will be vital, in such cases; a modern water system must function around the clock, and in all contingencies. We are prepared to keep our upwards of 150 miles of main lines, six storage tanks, five booster stations, our filtration plant, and some 630 hydrants in excellent working order."

It was pointed out that recent construction of sewerage lines in outlying communities was a real test of two-way radio worthiness. The use of power shovels and other heavy equipment resulted in numerous breaks in water lines, and interruptions in other services. Shenango Valley Water Co. kept its two-way radio-equipped trucks on the go, and men repaired line breaks and services almost as soon as they occurred, keeping customers satisfied.

One of the important functions of Shenango's two-way radio communication is borne out by human frailty—the human nature trait of putting things off till the last minute. Like notifying the water company that you wish service shut off while on vacation, or while moving.

"We have that problem licked, with two-way radio," commented Mr. Link. "During the vacationing seasons—summer or winter these days—you get calls at the office saying 'We're leaving and forgot to get the water turned off.' Now several of our office personnel are licensed to use the remote control transmitter and locate the service truck nearest to the address in question, and have service shut off."

Shenango Valley Water now keeps its organization functioning more smoothly all around, with two-way radio communication. At the garage, where one remote control unit is located, the man in charge has a simple peg-board system for keeping tab of cars, men and trucks in

(*Continued on page* 181)

● AT THE garage, even if he is busy in the shop, employee receives message through speaker located in the ceiling. Another speaker is in the storage area.

PLASTIC PANELS
PROTECT STREET LIGHTS

BRADFORD WEST,
Administrative Intern From the Institute of State and Local Government, University of Pennsylvania

PRIOR TO 1956 the Village of Oak Park, Illinois, had been faced with the annual expense of replacing over five thousand broken glass street light panels in the 3318 upright lantern-type street light heads still in use as part of the residential street lighting system. The replacement cost amounted to more than $1700 each year for the materials alone, with an even greater amount expended for labor. Although some of the breakage was due to natural causes, the greatest portion of the damage to the glass panels was caused by mischievous children armed with snowballs and other missiles. It had long been felt that this annual expense was unwarranted as an unplanned recreation program, but a permanent solution to the problem had not been found. The Village had often considered replacing the lantern-type heads with a head less susceptible to damage, but was reluctant to do so since it was felt that they aided in retaining a truly "village" atmosphere for Oak Park.

Early in 1956, a Trustee of the Village suggested the possibility that the Village might be able to use plastic panels in place of the easily broken glass panels. Village Manager Mark Keane and members of his staff became interested in the idea and explored the possibility. When a Village citizen offered to supply a plastic panel that he felt would solve the problem, the decision was made to purchase a limited number of the plastic panels as an experiment. All glass panels within a specially designated test area were replaced with the panels. A close watch was kept on the experiment for several months, and it was found that the breakage rate for the plastic panels was insignificant in comparison with the rate for the glass panels.

Despite their low breakage rate, the plastic panels used during the trial period were found to be somewhat unsatisfactory. Several of them had burned; they were not easily handled, and they resulted in a substantial loss of light transmission. For these reasons the Village contacted several companies in the Chicago area in an attempt to find a more satisfactory plastic panel. The Tayloe Glass Company, an Oak Park firm that had previously supplied the Village with glass panels, developed a fibreglass plastic panel

● **PLASTIC panel is being installed in one of Oak Park's lantern-type lamps.**

3/32 of an inch thick that was found to overcome the shortcomings of the earlier type of plastic panel. The Tayloe plastic panels are sufficiently heat resistant to withstand the heat generated by the street lamps. At the same time, they are sufficiently transparent to permit transmission of light in quantities quite comparable to the glass panels which they replace. The cost of the Tayloe panel is approximately fifty percent greater than the cost of the glass panel of the same size. Bids have been requested from other companies but to date none has been able to supply a comparable product at a competitive price.

In March, 1956, the Village began to replace the remaining glass panels in its residential street lighting system. At the end of July, 1957, Village street lighting crews reported that 13,900 of the plastic panels had been installed, representing slightly more than one-half of the 26,544 panels in the Village system. Practically no breakage of the plastic panels has been reported during this period except under extreme conditions such as the toppling of a light standard by an automobile. When all glass has been replaced by plastic, a substantial savings will result for the Village. First, there is no annual expense incurred to replace the plastic panels. This alone will more than overcome the difference in cost between the plastic and the glass panels. Second, the man-hours now consumed in replacing broken glass panels will be free for more important maintenance work. Hidden savings also result from the ease with which the plastic panels may be handled and installed, and from the reduced danger of cuts due to the absence of sharp cutting edges.

As a result of its program to replace glass street light panels with plastic panels, Oak Park may look into the near future and see the time when it will be relieved of the annual expense of replacing broken panels. The plastic panels which started as an experiment are now a well established part of the Oak Park street lighting system.

● **CLOSE-UP of light shows two broken glass panels. Plastic panels do not break.**

SMALL SEWAGE TREATMENT PLANTS:

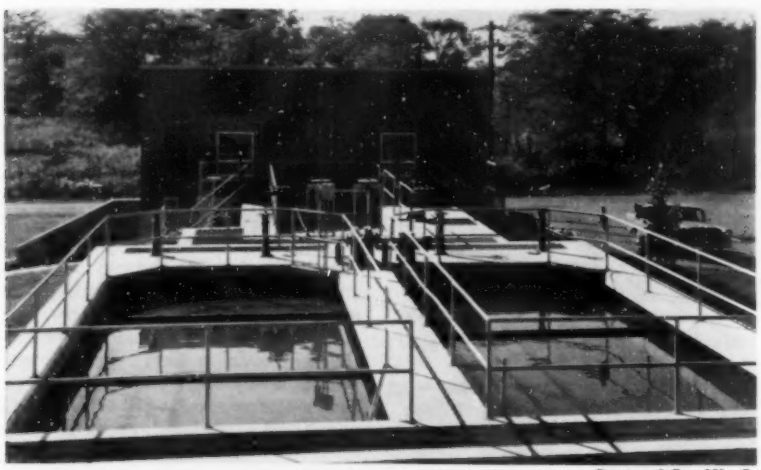
SEDIMENTATION

JOHN J. BAFFA,
Consulting Engineer,
New York City

SEDIMENTATION is an essential step in treatment, in large plants or small. It may be utilized for primary, intermediate or final processes. In small plants, special considerations are sometimes necessary because of cost, size, site factors and availability of equipment. There are three general types of sedimentation units—septic tanks which are suitable for only the smallest installations; single story tanks with separate sludge digestion, either hopper bottom or mechanically cleaned; and two-story tanks, either Imhoff or mechanized.

Septic and Imhoff Tank Regulations

The comments in State Department of Health design guides for sewerage works are of interest with respect to use of septic and Imhoff tanks. Missouri in its "Guide for the Design of Small Sewage Works" says: "Septic tanks will be accepted as a satisfactory means of primary treatment for installations receiving flows not in excess of 22,500 gallons per day. For temporary sewage works, Missouri considers septic tanks applicable up to flows of 50,000 gallons per day. Connecticut considers septic tanks applicable to populations less than 1500 persons. Texas and Idaho do not consider septic tanks suitable for municipal sewage because of low efficiency and difficulty of operation; Idaho permits their use only for treating sewage from schools, small institutions and residences. In New Jersey septic tanks may be constructed only with special permission of the Department of Health. In Florida, Illinois, Wyoming, South Dakota, Utah, Indiana, Iowa, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin, septic tanks are not approved except for residential and other very small installations.



Courtesy Jeffrey Mfg. Co.

● **PRIMARY tank requirements for small plants are generally 2 hours detention and 600 gallons overflow rate. This excellent small plant serves Bluffton, Ohio.**

Hopper bottom tanks without sludge collecting mechanisms are permitted by Texas. In Florida, Idaho, Illinois, Wyoming, Utah, South Dakota, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania and Wisconsin the use of non-mechanical sedimentation basins is, in general, discouraged except for installations too small to warrant the use of mechanically equipped tanks; except for combined aerator-clarifier units, non-mechanical basins are not permitted for final settling following activated sludge. North Carolina requires mechanical equipment except in small installations.

The Imhoff tank is acceptable as a method of primary treatment by Missouri when adequate maintenance is assured and when economic factors prohibit construction of separate sludge digestion. In Florida Imhoff tanks may be used in small systems, usually serving not more than 1000 persons, where sedimentation tanks and separate sludge digestion would prove unduly expensive. The Public Health Service "Manual of Septic Tank Practice" indicates that Imhoff tanks are more satisfactory than septic tanks in the 14,500 to 100,000 gallon per day flow range. At least eighteen states prohibit use of Imhoff tanks for treatment of milk wastes or other wastes which might create acid or excessive alkaline conditions. Some prohibit the use of Imhoff tanks for treatment of municipal sewage containing a high percentage of such wastes. At least sixteen states indicate that because of the possibility of odor nuisance, Imhoff tanks should be suitably isolated.

Design Criteria for Size

Operating experience with settling basins handling purely domestic raw sewage indicates that a detention of two hours will remove about 98 percent of the settleable solids and about 35 percent of the BOD, provided that surface loading is kept within the 600 to 800 gallons per day per square foot range; design should insure that short circuiting is minimized; floating solids are efficiently retained; and accumulations of solids which can become septic are prevented.

Practices vary among the State Departments of Health. Some provide detention criteria as well as minimum surface loading criteria thus establishing both volume and

surface area; others include surface loading and minimum depth.

For mechanically cleaned basins, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Wisconsin, Florida, Wyoming, South Dakota and Utah use surface rate criteria only and use the curve shown in Figure 1 to determine BOD removals by primary settling tanks. The requirements given below refer only to small plants (less than 0.5 mgd).

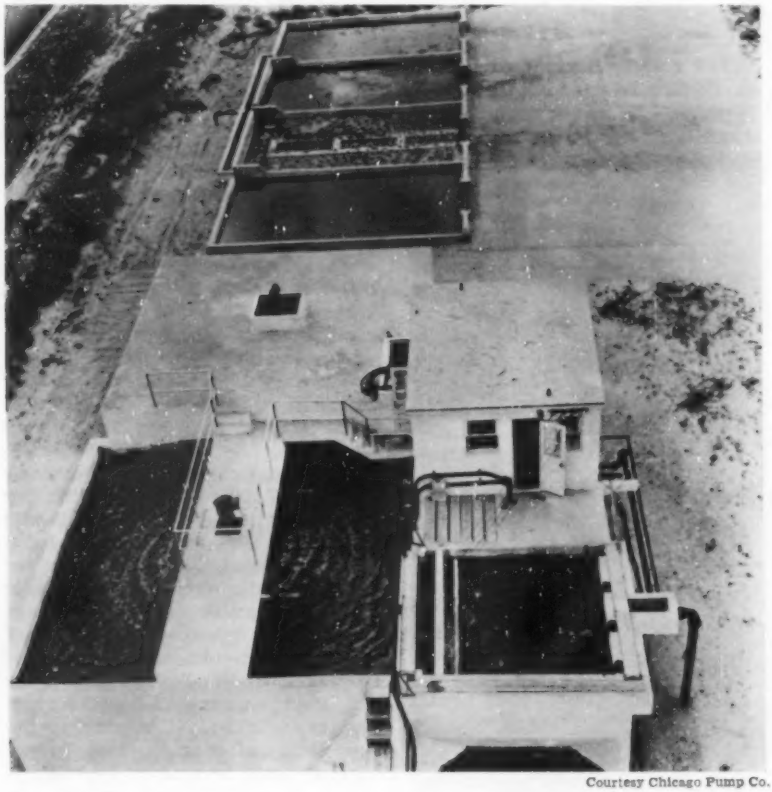
Primary Tanks: Surface settling rates for primary tanks not followed by secondary treatment shall not exceed 600 gals./sq. ft./day.

Intermediate Settling Tanks: Surface settling rates for intermediate settling tanks should not exceed 1000 gallons per square foot per day based on the design flow.

Final Settling Tanks: Surface settling rates for final settling tanks, based on design flow, varies with the type of secondary treatment used and shall not exceed the following: for standard rate trickling filters, 1000 gals./sq. ft./day; for high rate filters 800 gals.; and for activated sludge 800.

Depth: Mechanically cleaned sedimentation basins are generally required to be as shallow as practical but with a minimum water depth of 7 feet. Final clarifiers for activated sludge should have a minimum water depth of 8 feet.

For primary tanks as the only form of treatment, Connecticut requires 2.5 hours minimum detention and surface loading not over 1000 gallons per day per square foot; for primary tanks before trickling filters 2 to 2.5 hours and a surface loading not over 800 gallons per square foot per day; for primary tanks before activated sludge or high rate trickling filters with recirculation through the primary tank at least 1.5 hours with surface loading not over 1000 gallons per square foot per day. New Jersey requires one hour detention after standard filters and 2 hours after high rate trickling filters and activated sludge. To attain these detentions, depths and surface rates of primary tanks are indicated as follows: With standard rate filters, 5 to 6 ft. deep, overflow rate 1,000 gals./sq. ft./day; and with high rate filters and activated sludge 8 to 9 ft., and 800 gals.



Courtesy Chicago Pump Co.

● **AERATOR-CLARIFIER unit, Eastern Air Lines, Miami, design flow 90,000 gpd.**

Design Details

Most common criteria regarding design details of sedimentation basins to be found in State Department of Health guides relate to the prevention of solids accumulations and the effective removal of sludge and scum. The following list of requirements is taken from the standards of practice for sewage works adopted by the Upper Mississippi River Board of Public Health Engineers:

Inlets should be designed to dissipate the inlet velocity, diffuse the flow equally across the entire cross section of the settling chamber and to prevent short-circuiting. *Channels* should be designed to maintain a velocity of at least 1 foot per second at one-half design flow. Corner pockets and dead ends should be eliminated and corner fillets or channeling used when necessary.

The minimum *length of flow* from inlet baffle to outlet should be 10 feet.

Scum baffles must be provided ahead of outlet weirs on all primary settling basins. They are encouraged on all non-mechanical final settling basins for small installations not equipped for continuous sludge return.

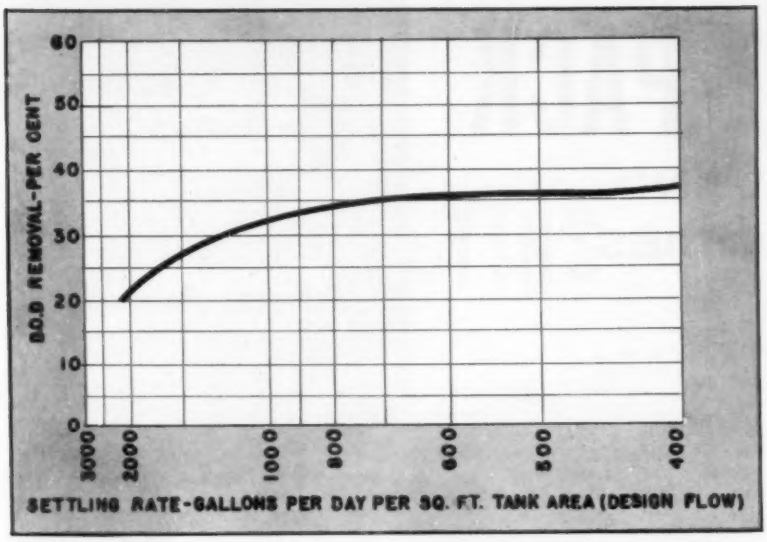
Overflow weirs must be adjustable. On circular tanks the weir length should be equivalent to the circumference. Weir loadings must not exceed 10,000 gallons per linear foot per day.

Submerged Surfaces: The tops of troughs, beams, and similar construction features which are submerged must have a minimum slope of 1.4 vertical to 1 horizontal. The underside of such structures should have a slope of 1 to 1 to prevent the accumulation of scum and septic solids.

Multiple Tanks: Consideration should be given to the use of multiple units but this will usually not apply to small plants. However when removal of a single unit from service for even a short period will result in objectionable conditions or material damage, at least two units should be considered, or other provision made.

Protective and Servicing Facilities: All settling basins should be adequately equipped to provide easy access for maintenance and for protection to operators. Such features include stairways, walkways, handrails, etc.

Scum Removal equipment must be provided ahead of the outlet weirs on all primary settling basins and should be considered for final sedimentation basins following trickling filters. The equipment should be automatic or provide for easy scum removal and the scum should



● **FIG. 1. Overflow rate—BOD removal curve used by many states for design.**

discharge to a sludge well for pumping to the digester.

Provision for continuous *sludge removal from* final settling basins is encouraged when the sludge is returned to a primary settling basin. Where sludge is removed from a settling basin to the digester, a sludge well should be provided or appropriate equipment installed for viewing and sampling the sludge.

The *depth* of mechanically cleaned sedimentation basins shall be as shallow as practical but with a minimum of 7 feet. Final clarifiers for activated sludge should have a minimum water depth of 8 feet.

The minimum slope of the side walls of *sludge hoppers* will be 1.7 vertical to 1 horizontal. Hopper floors should have a minimum dimension of 2 feet.

Design Details—Septic Tanks

A wide variation in septic tank design practices is to be found. The Public Health Service "Manual of Septic Tank Practice" sets forth the following design criteria: For flows up to 500 gallons per day, septic tank capacity should be at least 750 gallons; for flows between 500 and 1500 gallons, the capacity of the tank should be equal to the sewage flow times 1.5; for flows greater than 1500 gallons per day, minimum effective capacity should equal 1125 gallons plus 75 percent of the daily flow; over 14,500 gallons per day, Imhoff tanks may be more satisfactory for primary treatment.

The Missouri "Guide for Design of Small Sewage Works" recommends a design capacity of 150 percent of daily flow for domestic sewage and 200 percent of daily flow for domestic sewage and ground garbage. It is also required that inlets be designed to dissipate velocity and distribute the flow uniformly; that baffles extend 18 inches below the surface; and that the inlet elevation be such as to prevent surcharge of the influent pipe. Length is required to be 2 to 3 times the width, and depth about the same as width with a 4.5-ft. minimum. A scum baffle and overflow weir must be provided together with a manhole over the influent pipe. Freeboard to the under side of the cover must be at least 12 inches. Other states have generally similar requirements.

Imhoff Tank Design Details

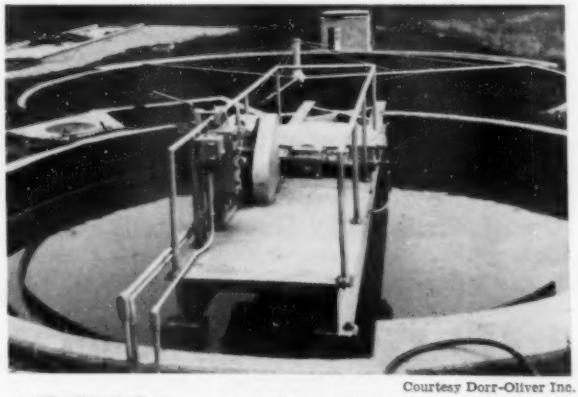
An example of best present day practice for Imhoff tank design is found in the "Standards for Sewage Works" of the upper Mississippi River Board of Public Health Engineers and Great Lakes Board of Public Health Engineers as follows: Based on the design flow, the detention period should be 2.5 hours. The maximum surface settling rate should be 600 gallons per square foot per 24 hours at average dry weather flow with consideration being given to excessive day-time flows or rates. Tanks should be provided with at least 18 inches of freeboard. The water level should not be more than 24 inches below the walkways or operating level.

The bottom slope of the flowing through chambers must be 1.4 vertical to 1 horizontal, and the slot opening six inches minimum measured on the slope of the hopper wall. The slot overlap must be six inches minimum measured on a horizontal plane.

The volume of the sludge compartment should be calculated as a space below a horizontal plane at the point of maximum overlap of the slot in the bottom of the settling chamber and planes having a slope of 30 degrees from the horizontal upward from the end of the sludge withdrawal pipe to the point of in-

(*Continued on page* 132)

● **PLANT at Bowie State Teachers' College, Bowie, Md., has 14-ft. primary and secondary clarifiers, 40-ft. diameter filter.**



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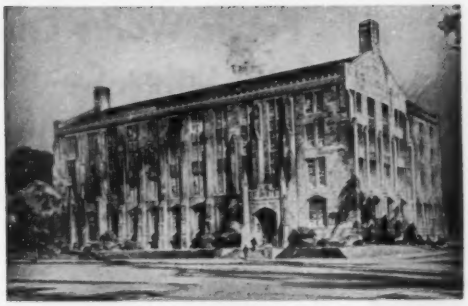
News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

McKinley Named General Chairman of 1958 Public Works Congress

Newport News, Va.—APWA President Sol Ellenson recently announced the appointment of Reed McKinley, Director of Public Works of Kansas City, Mo., as General Chairman of the 1958 Public Works Congress and Equipment Show which will be held in Kansas City, September 28 through October 1. The Show and Technical Sessions will be held in the huge Municipal Auditorium, which is ideally located just one block away from the Muehlebach, the headquarters hotel.

Exhibitor Brochures will be sent to all Sustaining members of the Association during the first part of February. Unreserved exhibit space will thereafter be made available to non-members who wish to display their products at this annual event which is expected to attract some 2,000 public works officials from virtually every part of the country.

Weaver Joins Headquarters Staff

Chicago, Ill.—Donald F. Herrick, Executive Director of the American Public Works Association, recently announced the appointment of Leo Weaver as a new member of the APWA headquarters staff. Mr. Weaver is a registered professional engineer and has been employed in various capacities with the Sanitary Engineering Division of the U. S. Public Health Service for the past nine years. He is 33, and was honored last year by several professional engineering societies as the Outstanding Young Engineer of the PHS in the nation's Capital.

Weaver assumed his duties as Director of Research beginning January 1. He has worked on water supply, sewage disposal and air pollution problems, but his primary responsibilities have been in the field of community solid waste disposal. He was in charge of a twenty-month experimental project in North Dakota to determine the feasibility of using the sanitary landfill method of refuse disposal in extremely cold climates. He is currently serving as Secretary of the APWA Refuse Collection and Disposal Committees, which are engaged in the preparation of authoritative texts in this field.

After becoming fully oriented in his new position, he will assume primary responsibility for the Association's Information Service, and will also assist the Executive Director in handling the administrative affairs of the APWA Research Foundation. His talents will also be utilized in various other ways to carry out the ever-increasing responsibilities of the headquarters staff.

Mr. Weaver is a graduate civil engineer of New York University and also attended the University of Iowa and the University of Maryland. He was born in Paterson, New Jersey, and served with the U. S. Army Corps of Engineers in the European Theatre during World War II. He was a member of the Executive Committee of the Virginia-D. C. Chapter of the APWA at the time of his appointment, and is a member of several professional organizations including the National Society of Professional Engineers, American Society of Civil Engineers, and American Public Health Association. He is married and has four children. They are now making their home in Park Forest, Illinois.

APWA Yearbook Now Available

Chicago, Ill.—The 1958 Public Works Engineers' Yearbook containing the proceedings of the Philadelphia Public Works Congress, a directory of members, commercial announcements, chapter officers and other data is now off the press. This new 452 page publication includes some forty papers on virtually every phase of public works. Authoritative discussions on streets and highways, sanitation, equipment management and on water and sewage, plus penetrating talks by Dr. Henry T. Heald, President of the Ford Foundation and Mayor Ben West of Nashville and President of the American Municipal Association, and by many other prominent speakers are all included in the new edition of the Yearbook. Free copies are being sent to all members as a regular membership service, and a limited supply is available for non-members at the price of $5.00 per copy. All orders for this publication should be sent to the American Public Works Association, 1313 E. 60th Street, Chicago 37, Illinois.

Director of Planning Commission Speaks at New Orleans Meeting

New Orleans, La.—Approximately 45 members and guests turned out for the December meeting of the New Orleans Chapter. Louis C.

OFFICERS: Sol Ellenson, Newport News, Va., *President;* Wm. D. Hurst, Winnipeg, Manitoba, Canada, *Vice President.* REGIONAL DIRECTORS: (term ending 1958) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (term ending 1959) Albert G. Wyler, New Orleans, La.; Edward J. Booth, Bismarck, N. D.; Frederick Crane, Buffalo, N. Y.; (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Texas. *Immediate Past President,* Robert Anderson, Winnetka, Ill. Donald F. Herrick, *Executive Director*

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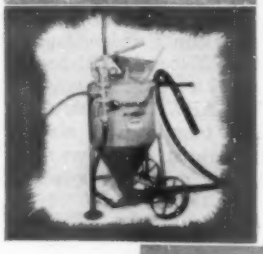

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MANUFACTURERS OF ADVANCED DESIGN CONCRETE GUNNING, MIXING, GROUTING AND SANDBLASTING EQUIPMENT.

Bisso, Director of the City's Planning Commission, gave an excellent presentation on "A Prospectus for Revitalizing the New Orleans Central Business District". His proposals envisioned many public works projects which made it extremely interesting to those in attendance. Chapter President Clarence H. Palm presided over the meeting.

Merrill Heads Maine Chapter

Portland, Maine — The Maine Chapter of the American Public Works Association held its annual meeting in Portland in conjunction with the annual convention of the Maine Municipal Association. The meeting included a display and demonstration of public works equipment and an inspection trip through South Portland's Public Works Building which is the most modern in the state.

Other highlights of the program included the election of a new slate of officers, the presentation of a paper on "Sewer Services" by George G. Inglis, Engineer, Cast Iron Soil Pipe Institute, and a lively panel discussion on "Street Openings" lead by George J. Maher, Director of Public Works of Lewiston.

Roger W. Merrill, Director of Public Works of Bangor, was elected President of the Chapter for 1958; Charles A. Haynes, Town Manager of Guilford, was named Vice-President; and George Maher was re-elected Secretary-Treasurer.

Trio Discusses Corrosion at San Diego Chapter Meeting

San Diego, Calif.—The December meeting of the San Diego-Imperial County Chapter of the APWA was held at the Mission Valley Inn in San Diego. Ernest A. Taylor, Street Superintendent of Oceanside and President of the Chapter, presided at the meeting which was highlighted by an informative discussion on "Corrosion". Participating in the discussion were E. D. Nordstrom, President of Local Corrosion Engineers; James Swales, Corrosion Engineer, 11th District, U. S. Navy; and Roy Dodson, Production Superintendent, San Diego Water Department.

Tennessee Public Works Officials Hold Annual Institute

Nashville, Tenn.—The Tennessee Chapter of the APWA joined with the Tennessee Building Officials Association to sponsor again a Municipal Public Works & Building Officials Institute in Nashville, December 5 and 6. The Institute was

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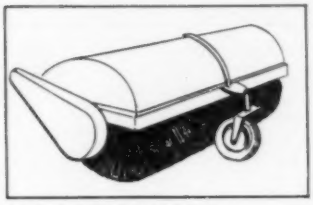
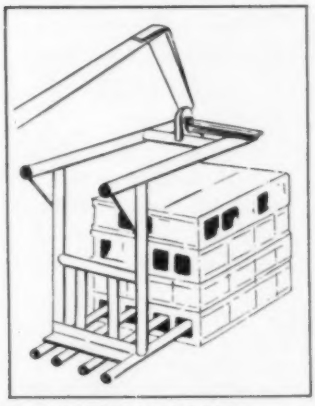
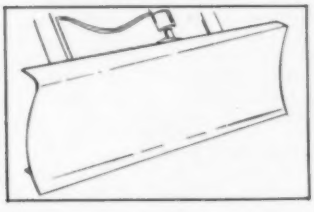


THE STRATO-BOOM



THE BACKFILL BLADE



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presented in cooperation with the Tennessee Municipal League and the University of Tennessee. The first day of the program was devoted to discussions of the following topics: "Can a City Prevent Slums by Adopting and Enforcing Codes?"; "Contract vs. Force Account for Street Construction"; and "Drainage Problems". Films were also presented by the Portland Cement Association and the Asphalt Institute.

The second day of the action-packed program was devoted to a discussion of four chapters of the 1957 edition of the book "Municipal Public Works Administration" (Available from the Institute for Training in Municipal Administration, 1313 E. 60th Street, Chicago 37, Ill.) Herbert J. Bingham, Executive Secretary of the Tennessee Municipal League was guest speaker at the banquet, which featured the presentation of Certificates to nearly 50 officials who had successfully completed the Institute Program.

Michigan Members Hear State Highway Officials

Detroit, Mich. — The regular monthly meeting of the Michigan Chapter was held on December 19 at Huck's Redford Inn. Urban Rubin, Director of Highway Information Service of the Michigan State Highway Department, discussed the state's highway construction program. He expressed opposition to pending legislation which would provide for the payment of utility relocation costs necessitated by highway improvements from Federal and State highway funds. C. H. Brown, Metropolitan Engineer for the Michigan State Highway Department, gave a detailed explanation of the state's highway program in the Detroit area and told of its progress to date.

Heads New Indiana Chapter

B. J. Swanson, Chairman of the Board of Public Works, Fort Wayne, Indiana, was elected the first president of the new Indiana Chapter of the American Public Works Association.

Chicago Luncheon Meeting Attracts Large Attendance

Chicago, Ill.—Over 160 members and guests, including Virgil Gunlock, Chairman of the Chicago Transit Authority and other notable officials, attended the December Meeting of the Chicago Metropolitan Chapter, which was held in honor of Robert L. Anderson, Village Engineer of Winnetka and Immediate Past President of the APWA. Chapter President A. W. Konefes presided at the meeting, which was held in the "Glass Hat" of the Congress Hotel on Chicago's lakefront.

The program featured a discussion on the "Selection, Procurement and Use of Municipal Equipment" led by James F. Moring, City Engineer of Evanston. Principal speakers were Richard B. Berry, Deputy Purchasing Agent for the City of Chicago, and Henry Berolzheimer, Automotive Equipment Engineer, also of Chicago. The next meeting of the Chapter will be held at the Midwest Country Club in Hinsdale, on Thursday, May 22, 1958.

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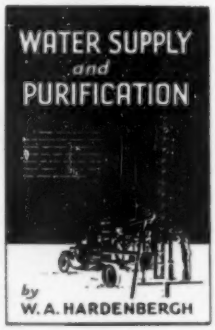
by Col. W. A. Hardenbergh



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Among the major changes introduced in this latest edition are the following: the chapters on ground water, on filtration, and on laying pipe and maintenance lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up to date and a new chapter has been added on fluoridation.

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Hydraulically powered towing wheels "fold away" into the main frame to give the *new* 4-6 ton Buffalo-Springfield* Model KT-8 Portable Tandem Roller profit-making advantages never before offered *in any other roller!*

The KT-8's exclusive "fold away" feature permits maximum ground clearance . . . and completely *eliminates excessive overhang!* The KT-8 can work in tight corners . . . around obstacles . . . up against high curbs and forms . . . without removing the wheels. And the new "fold away" design lets the operator actually *see* his work at all times!

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There are other profitable features, too. Torque converter drive *automatically* matches power to grade and material variations . . . permits infinitely variable speeds from 0.5 to 5.3 mph in either direction. Heavy-duty, high-speed, low-torque clutches provide smooth reversing without grabbing. Wide faced bevel gears assure long, trouble-free operation. *The KT-8 is built for maximum performance, dependability and durability in every respect!*

Buffalo-Springfield also offers a new 3-5 Ton Model KT-7A Portable Tandem Roller. The KT-7A does not include hydraulically powered towing wheels but offers towing attachment as optional equipment. The attachment includes towing hitch with hydraulic jack, stub axle assemblies with pneumatic-tired wheels, and wedge blocks.

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THE DEMONSTRATION of chemical reactions to those having limited chemistry training can be made much easier by a change in the method of presenting equations. This is particularly true if it is necessary to label each component. The reaction between alum and alkalinity will serve to illustrate.

An equation presented in this fashion can be read at a glance. There is a distinct advantage of showing the name of the compound opposite its formula and in not having to read an equation continued on another line. Anyone familiar with chemical formulae are not distracted by the column of names. Vertical equations are easier to balance with the formulae closely grouped and in column. Additional columns of data, such as molecular weights, can be added if needed.

Revised Method

Formula	*Common Name*	*Weight Ratio*
$Al_2(SO_4)_3 \cdot 18H_2O$	Aluminum Sulfate	1
+		
$3Ca(HCO_3)_2$	Calcuim Bicarbonate	0.73*
↓		
$2Al(OH)_3$	Aluminum Hydroxide	0.235
+		
$3CaSO_4$	Calcium Sulfate	0.612
+		
$6CO_2$	Carbon Dioxide	0.396
+		
$18H_2O$	Water	0.486

*0.45 as Calcium Carbonate, $CaCO_3$

Common Method

Formula	$Al_2(SO_4)_3 \cdot 18H_2O$	+	$3Ca(HCO_3)_2$	→	$2Al(OH)_3$	+	$3CaSO_4$	+	$6CO_2$	+	$18H_2O$
Common Name	Aluminum Sulfate		Calcium Bicarbonate		Aluminum Hydroxide		Calcium Sulfate		Carbon Dioxide		Water
Weight Ratio	1		0.73 (0.45 as calcium carbonate. $CaCO_3$)		0.235		0.612		0.396		0.486

Timewasters

(*Continued from page 97*)

(13) The grove of trees, though small, had to be complete and carefully laid out. Specifications said "25 trees in 12 straight rows; and in each row five trees. Yep, 25 trees in all—no more, no less.

(14) And here is another tree problem: A man hired an engineer, says Mr. Bray, to lay out his grounds. He had 12 trees planted and he insisted that they be arranged in such a way that he should have 6 rows with four trees in each row. How did the engineer work this out?

Financial and Business

(15) A man got a check cashed at a bank. The teller in cashing the check got the dollars and cents transposed. The man spent $3.50 on his way home and when he got home he found that he had twice as much money as called for on the check. How much was the check drawn for asks John Bevan.

(16) Then there was a square field enclosed with a board fence. Each board is 11 feet long and the fence is four boards high. The owner asked the engineer to tell him how many acres there were in the field. The engineer said: "There are as many acres in the field as there are boards in the fence." Yes, boys, it's quite a field. Sounds like John Bevan again.

(17) Another man has in his pocket $14.19 in coins and bills. He is unable to make change for a nickel, a dime, a quarter, a dollar or a five-dollar bill. What does he actually have in his pocket?

(18) A man has $1.15 in modern U. S. currency but cannot make change for any coin up to and including a dollar, i.e., a nickel, dime, quarter, half-dollar or dollar. If he has neither a dollar bill nor a silver dollar, what coins has he?

(19) A candle manufacturer, while experimenting with different types of tallow, lit two candles of equal size at 10 a.m. They both burned evenly, and one was consumed at the end of four hours, while the other lasted two hours longer. For some reason or other he was anxious to know when one candle was five times as big as the other, but he was called out of the office at the time it happened and thus missed the big event. Can you tell him exactly when the slow-burning candle was five times the size of the fast-burning candle?

(20) A man has 17 mules and gives them to his three boys. To the first he gives one-half of them, to the second one-third and to the other one-ninth and he does not kill any. How does he divide them?

(21) The grocer had an old-fashioned balance scale like that used by the statue of Justice. But one day some mischievous kids stole all but three of his weights. Being of a timewasting turn of mind, he fiddled around with these weights and found that he could, by using both pans of the scale, weigh any amount from 1 to 13 pounds. What were these three weights?

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If you are interested, we'll be glad to tell you of the many revolutionary features which contribute to the digging speed and durability of the new Model "F". Just drop us a line for Bulletin No. 570.

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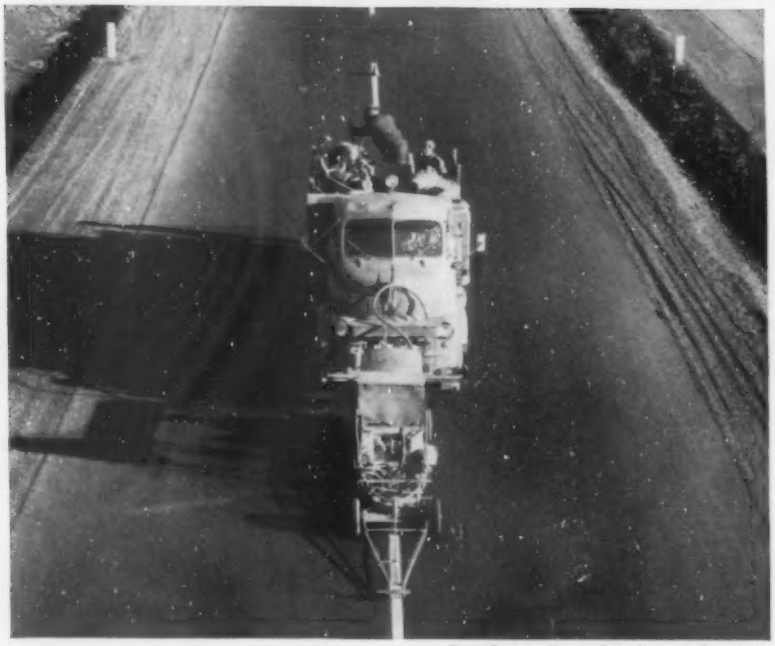

Photo Courtesy Oregon State Highway Commission

New striping machine "welds" hot paint to highway

Onan Electric Plant, mounted on vehicle, supplies current for 6,000-watt electric heater

Highway striping has always been a headache for maintenance departments. The paint dries slowly, wears off too quickly, and it's expensive.

The vehicle shown above helps with all three of these problems by heating the paint to 160° before application. Hot paint dries within five minutes, it wears longer because it penetrates and bonds to the surface . . . and 30% less paint is required.

Current for the two 3,000-watt heating elements is supplied by an Onan 7,500-watt electric plant, powered by a smooth-running, two-cylinder, air-cooled Onan gasoline engine.

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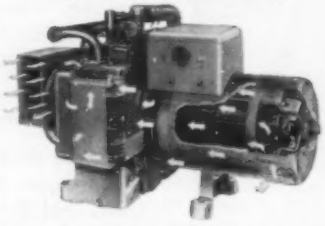

With Onan's Vacu-Flo system, air is drawn, (rather than blown) through generator and engine, and discharged through a duct to the outside. An Onan air-cooled plant with Vacu-Flo can be installed in a small compartment within a truck or trailer.

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The Engineering Students

(22) A large class entered engineering college in the fall, but soon it began to lose members. At the end of the first semester, one student went home sick and one-fifth of the remainder were flunked out. At the end of the second semester, one student had been drafted and one-fifth of the remainder were flunked out. At the end of the third semester one boy got married and had to go to work and one-fifth of the remainder were flunked out. The end of the fourth semester saw the lone girl in the class quit and get married and the standard one-fifth of the remainder flunked out. The same old story was repeated at the end of the fifth semester, one left voluntarily and one-fifth flunked out. At this time the class was evenly divided between civil, mechanical, electrical, sanitary and chemical engineers. How many entered college and how many were left

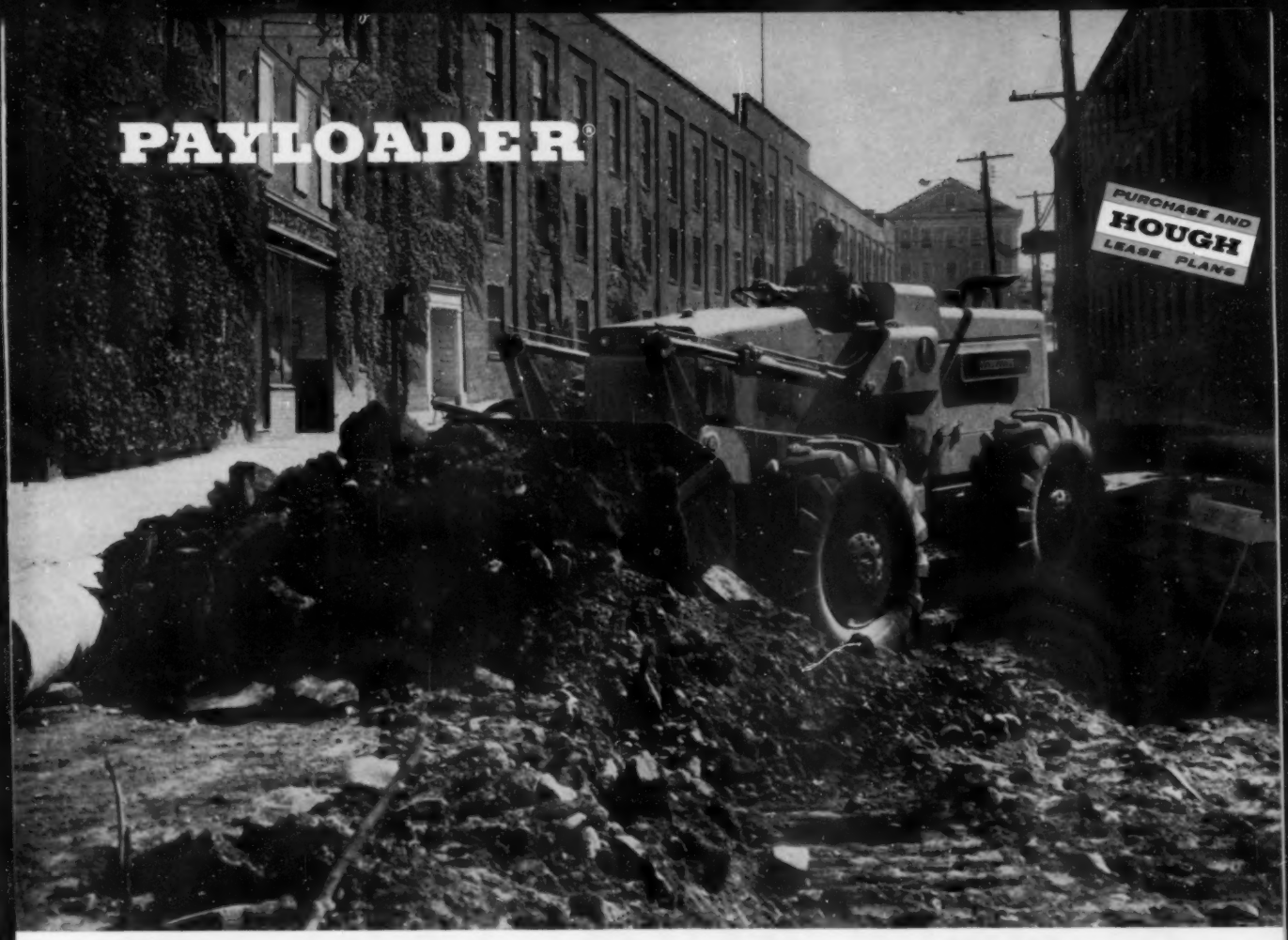
Around the World

(23) A problem that used to worry the Tennessee folks according to Jerry Cavanagh, was this: Given the diameter of the earth as 8,000 miles at the equator, how long a wire would be needed to pass entirely around the earth at the equator, but 6 feet from the surface at all points?

(24) And here is the next one: Using that same earth, still 8,000 miles in diameter at the equator, with a wire passing around it snugly —and neglecting mountains—how much would that wire have to be lengthened so that a post 6 inches high could be inserted under the wire?

(25) Three correct-reading thermometers were hanging on a New Hampshire barn—Fahrenheit, Centigrade and Reamur. One afternoon: the F registered plus X degrees. That night the C registered minus X degrees. Next morning the R registered minus X degrees; and at this time the sum of the R and F readings equalled the C reading. What were the nine readings, with their proper signs, asks Walter Wheeler.

(26) Two ladders of unequal length are placed across an alley, intersecting 2 ft. above the pavement. Designating the ladders as *ab* and *cd*, the intersection as *e* and the projection of the intersection as *f*, and assuming that *ab*, *bc*, *cd* and *ad* are all whole numbers, how wide is the alley? Sounds like one from Bob Clark, now in Geneva, Switzerland.



"Pry-out Action is boss on this job!"

That's what Supt. Ed Jablonski says about this model HO "PAYLOADER", adding, "I've never seen a machine that could compare with its work-ability, speed of loading and dumping."

Operator Henry Staiger says, "On this job, I've been ripping out a 4-inch bituminous surface plus 8 to 10 inch stone base. The rip-out and loading action is the fastest I have ever experienced on any loading machine."

Superior digging power and loading speed are big reasons why a "PAYLOADER" outperforms all other tractor shovels, size for size. Equally as important as performance is the greater usefulness you can be sure of getting when you buy a "PAYLOADER". That's because of the wider choice of quickly interchangeable attachments—some of them available only on a "PAYLOADER", such as black-top spreader, side-boom, 4-in-1 bucket, and pick-up street sweeper. You can also have blower, "V", and blade-type snow plows, backhoe and others. Ask your "PAYLOADER" Distributor to *prove* this superior performance *and* usefulness. Ask him about Hough Purchase and Lease Plans too.

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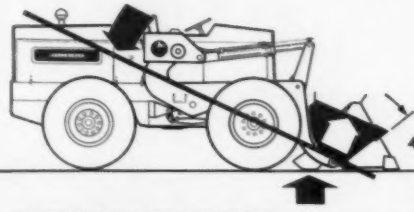

TREMENDOUS PRY-OUT FORCE — almost equal to the weight of the machine — can be exerted at the bucket digging edge by using the break-out pads on bottom of lifting arms as a ground support or fulcrum. Pads transfer load stresses to the ground, not the front axle.

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Send more data on "PAYLOADER" tractor-shovels as checked:

- ☐ HO - 9,000 lb. Carry Cap. (1 to 4 cu. yd. buckets)
- ☐ HH - 7,000 lb. Carry Cap. (⅞ to 3¼ cu. yd. buckets)
- ☐ HU - 5,000 lb. Carry Cap. (⅜ to 2⅛ cu. yd. buckets)
- ☐ HF - 3,000 lb. Carry Cap. (⅜ to 2 cu. yd. buckets)

Name.....

Title.....

Company.....

Street.....

City.....State.....

2-B-3

(27) A water works superintendent bought a lot of 4, 6, 8, 10, 12 and 16-inch pipe. At the end of the season, he found that: (1) He had 101 feet of 4-inch left; (2) that he had laid one-fifth as much 6-inch as 4-inch and had one foot of 6-inch left on hand; (3) that he had laid one-fifth as much 8-inch as 6-inch and had 6 feet of 8-inch left on hand; (4) that he had laid one-fifth as much 10-inch as 8-inch; (5) that he had laid one-fifth as much 12-inch as 10-inch; (6) that he had laid one-fourth as much 16-inch as 12-inch; (7) that he had no 10-inch, 12-inch or 16-inch left. What was the smallest amount of pipe of the various sizes he could have purchased?

(28) The engineer was sorry to have to discard last year's license plate from his car, for the numbers made a beautiful poker hand—a full house. He was disgusted to note that on his new plate all five figures were different. To top that, he inadvertently screwed the plate on his car upside-down with the result that he increased his registration number by 78,633 until he noticed the error. What was the number on his license plate? From Ben Eisner, as we recall.

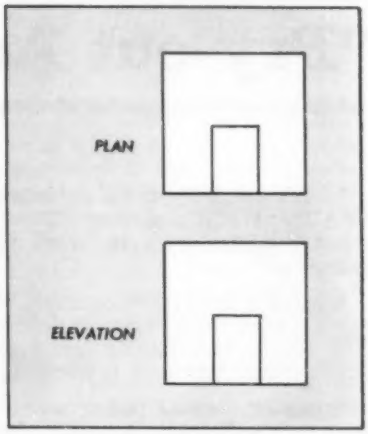
(29) If a clock is stopped for a minute every 10 minutes, how long will it take the minute hand to complete a revolution?

(30) The old town clock, says Ben Eisner, has gone haywire. Each hour it slows down by exactly one minute. If it keeps going without resetting, how long are the intervals between truth-telling?

(31) Here is one that elicited praise from some of our best Timewasters—besides being a mite difficult: A hound that had proved its ability to smell a fox at 1100 yards, but no farther, was riding on the running board of an automobile going due south on a paved road at 75 miles per hour. When the car carrying the dog was exactly one mile north of a fox trail that crossed the road at right angles, a fox crossed the road running due east at the rate of 60 miles an hour. If both the automobile and the fox maintain their respective speeds, for what length of time, if any, will the dog be able to smell the fox? Probably from John A. Bevan.

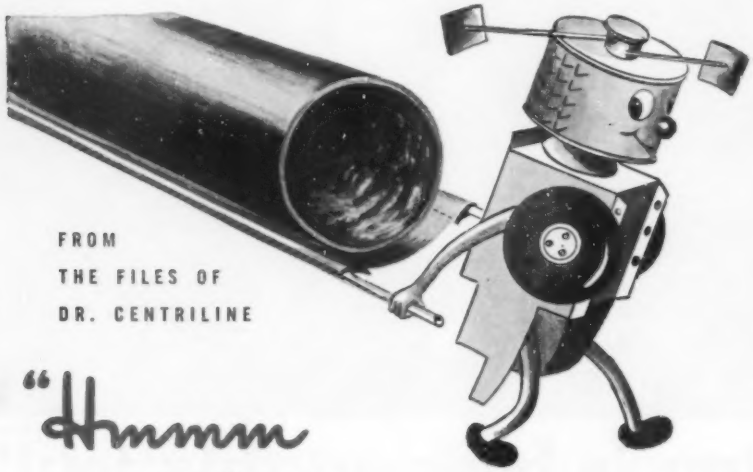
Now, if you solve that, you might as well go on and find out what the shortest distance between them will be, and when it will occur.

(32) A contractor had sharpened up his pencil to work on a bid, when he discovered that he had only the plan and elevation of the structure,



as shown herewith, but that the side view was missing. He remembered that the side view had no dotted or hidden lines. Can you supply it for him?

We will be pleased to have your comments on these "Timewasters" and to see how you approached a step-by-step solution to the more involved mathematical problems. If you got stuck, we will supply answers on request.



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SYMPTOMS: Lack of water and pressure during periods of high demand requiring restrictions in the summertime.

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TREATMENT: The lines were cleaned and cement lined in place without interrupting service to consumers. In less than 8 weeks the entire job was completed.

RESULTS: Patient now sound and healthy; pipe capacity permanently doubled, no further summer restrictions, future maintenance costs were eliminated.

If your lines also show signs of suffering from corrosion, leakage or tuberculation, investigate the Centriline Process. Cleaning and cement lining in place has been a successful remedy for over 1,000 miles of water supply pipelines. Centriline hasn't lost a patient yet.

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To insure a successful solution, the City of Dallas installed an Electro-Matic Model 1033 Volume-Density Controller. Now traffic moves through this intersection freely, and without unnecessary delays.

For literature describing this equipment write for Bulletin C-135D.

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PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

Biochemistry of Activated Sludge

In an attempt to shed further light on the biochemistry involved in the oxidation of pure organic compounds by biological waste disposal methods, activated sludge systems were developed in the laboratory using pure organic compounds. Sufficient inorganic salts were added to maintain nutritional balance. Organic compounds chosen for study were from the major groups found in sewage — carbohydrates, proteins, and fats. It was found that activated sludges developed on structurally related chemical compounds produced similar biochemical changes. The chemical structure of the organic matter fed to activated sludge was found to be the controlling factor in predomination of microorganisms. With arginine, a grouping in the chemical structure of the molecule was indicated which prevented it from being completely metabolized.

"Activated Sludge Cultures Developed on Pure Organic Compounds." By R. S. Engelbrecht and R. E. McKinney, Massachusetts Institute of Technology. *Sewage and Industrial Wastes*, December, 1957.

End 25-Year Pollution Problem

The City of Raleigh, N. C., recently dedicated its new Walnut Creek sewage treatment plant, thereby overcoming a serious problem of polluting the Neuse River. The plant also eliminates the possibility of repeated lawsuits against the City for endangering the water supply of the town of Smithfield, which is located 30 miles downstream. It was designed to provide complete treatment for a flow of 12 mgd, which capacity should serve the City until 1970. To provide flexibility of operation and facilities for growth, the plant was designed with three complete units, each having a capacity of 4 mgd. Space is available at the site for future expansion. The following elements were included: Diversion manhole; mechanical screen and shredder; grit chamber, metering device; raw sewage pumping station; distribution box; primary clarifiers; trickling filters (with 2:1 recirculation); secondary clarifiers; chlorine contact tank and flash mixer; sludge digesters and control house; sludge drying beds; and main operating building and laboratory. The entire project, including outfalls and pumping stations, was financed by voting and floating general obligation bonds of the City of Raleigh in two issues aggregating $3,447,000.

"Dedication of Walnut Creek Plant Ends 25-Year Pollution Problem." By Troy A. Doby. *Wastes Engineering*, December, 1957.

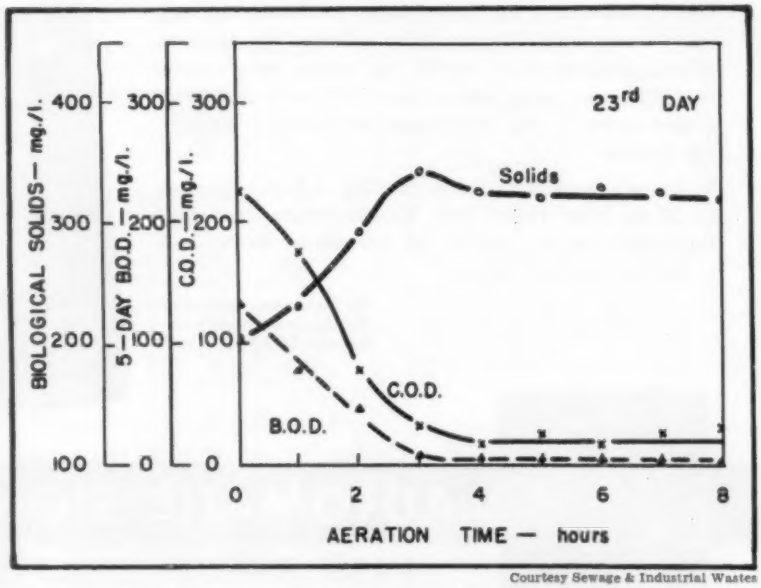
Mesophilic Anaerobic Digestion

The author discussed the fundamental factors of the process of utilizing mesophilic anaerobic digestion for treatment of sewage in a previous installment. In this concluding installment he discusses the means, in terms of overall design, and equipment, for increasing the rates at which the reactions which characterize the decomposition of waste organic substances can proceed. The author hopes that the many suggestions which have been made will prove of interest and assistance to both engineer and operator and will contribute to reduction of cost of investment, through increased operating efficiency and improved plant maintenance.

"Mesophilic Anaerobic Digestion —Part II." By L. L. Langford. *Water and Sewage Works*, December, 1957.

Sanitary Landfill Gas Control

Anaerobic decomposition of the putrescible organic matter in sanitary landfills and sewage sludge digesters leads to the production of methane and carbon dioxide, the former being flammable. Usually the gas is dissipated to the atmosphere through the porous cover material thereby preventing the accumulation of the gas in dangerous concentrations. The town of Arlington, Massachusetts, has operated four sanitary landfills for the past ten years. Routine investigations for leaks by the



Courtesy Sewage & Industrial Wastes

● **BIOCHEMICAL changes with aeration in an activated sludge unit fed with lactose.**

Largest floating cover digester installation on the West Coast—San Francisco's North Point Sludge Treatment Plant

At San Francisco, California . . .

10 P.F.T. Floating Cover Digesters installed to gain "Controlled Digestion" advantages

In operation since 1952, this modern plant has a digester capacity of 2,451,000 cubic feet, and handles sewage sludge for a population of 1,169,000. The plant was designed and equipped to effectively control action in the digestion tanks, and to efficiently utilize the large volume of solids.

There are two batteries of five digesters, and a control building for each group. All ten digesters are equipped with 100′ diameter *P.F.T. Floating Covers* for positive scum submergence and safe utilization of gas. The snug-fitting P.F.T. covers eliminate odor problems—an important consideration in this installation because of a residential area close-by. Gas collected under the domes is maintained at constant pressure under all operating conditions, greatly reducing explosion hazards. Capacity is highly flexible, because no fixed levels need be maintained; covers simply rise or lower with additions and withdrawals.

Housed in the control buildings are a total of eight *P.F.T. #1500 Digester Heaters and Heat Exchangers*, equipped with automatic controls. These heaters—using sludge gas as fuel—maintain constant digester temperatures, and also heat the control buildings. Rated heater output capacity is 12,000,000 B.t.u./Hr. Other P.F.T. equipment at this plant includes *P.F.T. Floating Cover Position Indicators*, and a full complement of *P.F.T. Gas Safety Equipment.*

Design of plant by / *Engineering office of Clyde C. Kennedy, San Francisco, Cal.*

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local gas utility disclosed concentrations of gas above the lower explosive limit under the pavement adjacent to the Summer Street Landfill. Any concentration of explosive gases under the foundations of the residences along this street had to be prevented. Analysis of the gas from nineteen sampling holes drilled along Summer Street showed the presence of gas exceeding the lower explosive limit 90 percent of the time in 13 of the sampling holes. Exact analysis by the mass spectrometer method showed that the source of the gas was the sanitary landfill. Subsequent investigation showed that oil had been added to the earth cover to control the blowing dust during the earthfill operations. This oily surface subsequently prevented the escape of the gases to the surface resulting in their passage horizontally through the gravel bank and under Summer Street to beneath the foundations of the houses. It was recommended that a trench be dug into the landfill close to Summer Street, thereby intercepting the lateral movement of the gases, and preventing any possible accumulation to dangerous concentrations. The significance of these studies to other communities is that precautions must be taken at the start of landfilling operations to prevent the lateral flow of gases to nearby residences or other buildings.

"Sanitary Landfill Gas Control." By Rolf Eliassen, Francis N. O'Hara, and Edward C. Monahan. *The American City*, December, 1957.

Sludge Elutriation and Filtration Studies

Conditioning of digested sludge at the Little Miami plant is based on elutriation and coagulation with ferric chloride. The mixing and settling tanks provided for elutriation of digested sludge and supernatant are arranged for either counterflow or single continuous flow operation. Elutriated sludge is mixed with about 21 percent ferric chloride, the elutriated sludge elevator being interlocked with the ferric chloride feeder. The cake resulting from filtration is burned in a five-hearth furnace. Good filtration yields with little cloth blinding can be obtained with cake ¼ in. or more thick, where sludge solids amount to 8 per cent or more. Elutriation can result in solids loss, preventing the 8 percent minimum from being attained. Plant studies show that filter yield is directly proportional to drum speed and sludge concentration, the relation with drum speed being logarithmic and that with concentration, straight line. The filter leaf test for evaluating filter operation is preferred to the use of the Buchner funnel because of more comparable results. Filter yield increases with increasing ferric chloride dosage to a maximum and then decreases. Addition of ferric chloride or alum to sludge for elutriation produces cleaner supernatants but less compaction. Neutralization of colloid particle charge with sulfuric acid effects good compacting at pH 5.5. A study of sludge conditioning for filtration shows a need for further work.

"Sludge Conditioning and Filtration at Cincinnati's Little Miami Sewage Works." By Dean Taylor. *Sewage and Industrial Wastes*, December, 1957.

Ohio's Problem with Acid-Mine-Drainage

A report has just been issued by the Engineering Experiment Station of the Ohio State University covering results of a research project in stream pollution caused by acid water from coal mines. Five basic methods of correction were suggested: Elimination of basic cause

water, waste and sewage treatment equipment

Central Sewage Treatment Plant, Williamsport, Pa. Equipment by Walker Process includes Diffusair SPARJERS, Bar Screen, Grit Chamber Equipment, Primary Collectors, Digester Covers, HEATX sludge heat exchangers, and Elutriation Tank Units. Williamsport's West Sewage Treatment Plant is also equipped by Walker Process.

The Chester Engineers, Pittsburgh, Pa. — Consulting Engineers

The Central Sewage Treatment Plant at Williamsport, Pennsylvania is the major part of a two plant, inter-community sewage treatment program which is serving three communities, as well as important industries, and eliminates troublesome stream pollution.

As with all well designed present day installations, Williamsport's regional program reflects careful planning and thorough engineering by the Municipal Officials and their Consulting Engineers. Designed with ample capacity for present day flow, the Central Plant may be expanded, with relatively simple additions, to serve the Williamsport area for years to come!

All of the equipment, manufactured by Walker Process may be relied upon to fulfill its part in this long-range program.

Contact Walker Process for information on equipment to serve your installation.

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Factory — Engineering Offices — Laboratories Aurora, Illinois

TYLOX RUBBER GASKETS and REXON PIPE COATING

provide a "long lease on life" for storm-sanitary sewers in Hong Kong Bay

This 72" sewer is being installed along a runway at Kai Tak Airport, which juts straight out into Hong Kong Bay. It must handle not only abrasive storm water run-off, but also the acid-laden sewage and petroleum wastes from business buildings, hangars and repair shops of the development. It must perform without failure of the pipe, or leakage of the joints, and for as far into the future as finest engineering, materials and construction methods can make it.

In specifying acid-resistant, compression-sealing TYLOX Rubber Gaskets for the joints, and abrasion-resistant, non-corroding REXON Coating for *extra* protection of the pipe, engineers not only provided to the utmost for the safety and longevity of the system, but made possible substantial savings in construction costs . . . *Flexible* TYLOX is quickly assembled to pipe, and permits fast assembly of the line. It compensates for pipe angularities, permits wet trench jointing and immediate backfilling. Used together, TYLOX Gaskets and REXON Pipe Coating make pipe lines leakproof and acid-resistant *throughout.*

SEND FOR more **TYLOX** and **REXON** data and case histories. Hong Kong is typical only of how these companion Hamilton Kent products are used the world over to make leakproof, non-deteriorating sewerage and drainage lines a certainty.

***PROJECT:** KAI TAK Airport Development, Government of Hong Kong.

ENGINEERS: Scott & Wilson Kirkpatrick & Partners, London, S. W. 1.

CONTRACTORS: Gammon (Malaya) Ltd., Kowloon, Hong Kong.

PIPE: 18" to 72" reinforced concrete, manufactured by Gamco Pipes Ltd., a subsidiary of Gammon (Malaya) Ltd.

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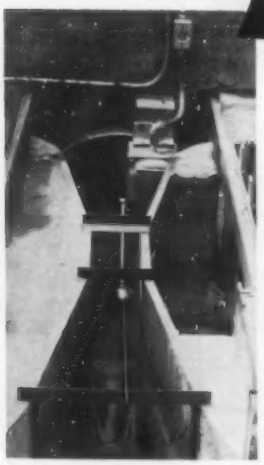

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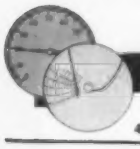
Think of the savings! Think of the elimination of maintenance!



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by excluding air or water, adding chemicals or destroying bacteria causing much of the acid; reclaiming the sulfuric acid; dilution by dams or reservoirs; physical treatment as neutralization by chemicals; or biological treatment as by bacterial action. A reservoir was constructed near Wellston from which data are being gathered. A small drift mine was scaled and is under study. Studies are also being made on the utilization of gob in the production of light weight aggregate.

"The Acid Mine-Drainage Problem in Ohio." Edited by E. Q. Moulton. Bulletin 166, Engineering Experiment Station, The Ohio State University, Columbus 10, Ohio.

Other Articles

"Corpus Christi Dewaters Sludge in **Heat-Controlled Rotary Dryers.**" By Harry H. Vindock. Wastes Engineering, December, 1957.

"**Hyperion Plant** Expanded to Treat 420 mgd." By David L. Narver and E. H. Graham, Civil Engineering, December, 1957.

"Inter-Community Action Forestalls Pollution in **St. Louis Fringe Area.**" By William Q. Kehr. Wastes Engineering, November, 1957.

"Joint City-County Treatment Plant for **Wilmington, Sanitary Districts.**" By John I. Cahalan. Wastes Engineering, November, 1957.

"**Refuse Collection** By Packer-Type Vehicles." Public Works, January, 1958.

"City-County Control **of Subdivision Sewage Disposal.**" By A. Anne Dunbar, and Joseph J. Weinstein. Public Works, January, 1958.

"United States Sewage Treatment Practices During the **Early Twentieth Century.**" By Ralph Porges. Sewage and Industrial Wastes, December, 1957.

"**Computation of Pollution** in the Yaquina River Estuary." By W. V. Burt and L. D. Marriage. Sewage and Industrial Wastes, December, 1957.

• • •

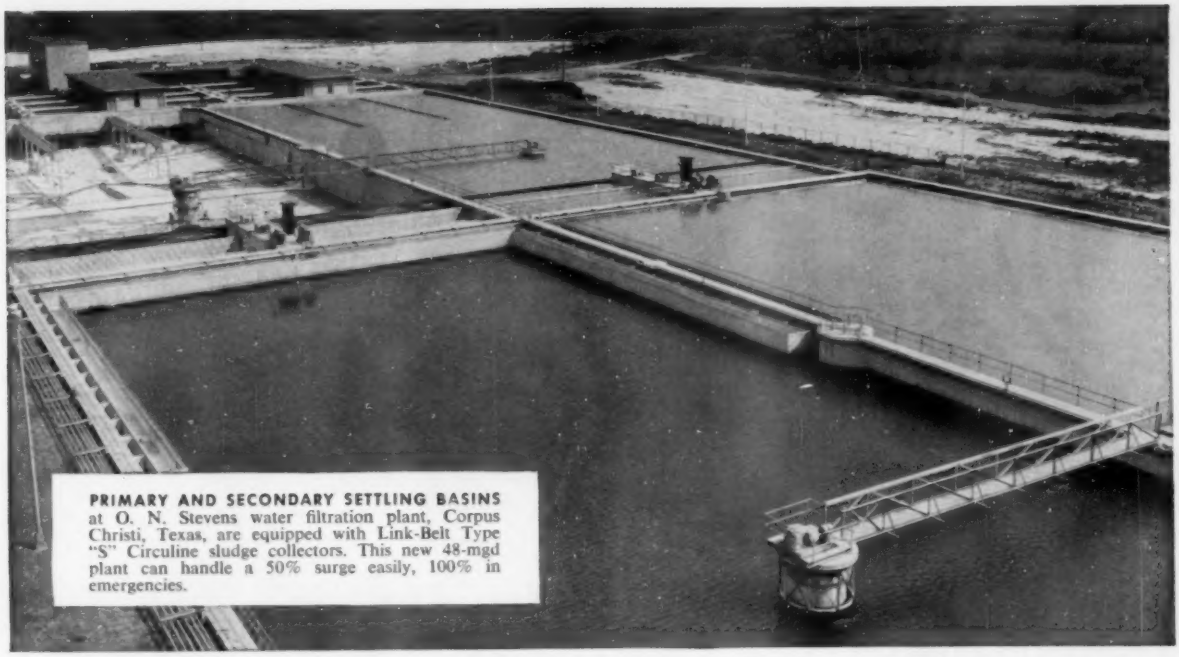
Small Sedimentation Tanks

(*Continued from page* 115)

tersection with the vertical walls. Imhoff tanks with more than one sludge hopper should be equipped for reversal of flow or provision should be made for equalizing sludge levels in sludge compartments by pumping. Each sludge hopper must have an individually valved sludge withdrawal line.

The total gas vent area should be at least 20 percent of the area of the sludge compartment. One gas vent must be at least 24 inches wide. Gas collection covers or submerged roofs over gas vents are not recommended.

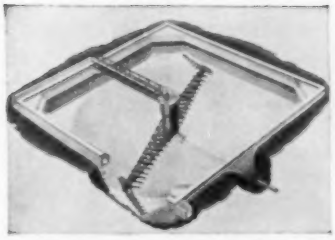
For gravity withdrawal, sludge lines should not be less than 8



PRIMARY AND SECONDARY SETTLING BASINS at O. N. Stevens water filtration plant, Corpus Christi, Texas, are equipped with Link-Belt Type "S" Circuline sludge collectors. This new 48-mgd plant can handle a 50% surge easily, 100% in emergencies.

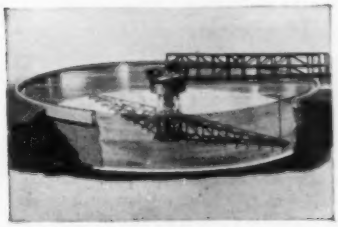
Four types of LINK-BELT Circuline collectors

offer positive sludge removal

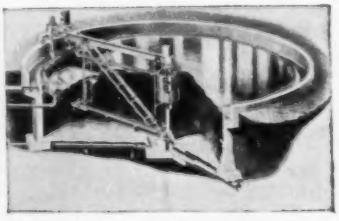


TYPE "S" — specially designed for square and rectangular tanks. As collector revolves, pivoted arms on ends of rakes adjust to thoroughly remove sludge from basin corners.

TYPE "R" — available in models for bottom feed, side feed or cross flow applications . . . in a wide range of sizes. Pitched blades gently convey sludge to center of tank.



TYPE "T" THICKENER — for rugged duty. Similar to "R" collectors except for heavier design. Furnished with fixed rake and automatic or manual lift types.



TYPE "C" — uses simple, positive traction drive to rotate bridge. Slow-speed straightline collector, with long-wearing, corrosion-resistant chains, removes sludge.

There's a design to fit any requirement of tank capacity or construction

THERE's no problem of septicity in settling tanks where Link-Belt Circuline collectors are used. Traveling smoothly and gently, they assure minimum disturbance of flow and the greatest possible concentration and removal of solids in least time.

This efficiency is typical of all the equipment in the complete Link-Belt line for water, sewage and industrial liquids treatment. And it testifies to the value of Link-Belt's more than 35 years' experience in sanitary engineering.

Link-Belt will gladly work with your consultants and chemists on *any* treatment problem. Call your nearby Link-Belt office.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

14,854

BUCYRUS-ERIE ANNOUNCES New, Improved 12-ton H-5 Hydrocrane with 90 Hydraulic Horsepower

Now, the capacity of the H-5 Hydrocrane is boosted to 12 tons. And an extra complete hydraulic circuit provides faster speeds and better coordination of all crane movements.

In addition, the H-5 has many outstanding new features that put it farther ahead of ordinary truck cranes. Check these new advances and see why:

Crane Capacity Increased to 12 Tons One-third more useable horsepower is now provided. More powerful boom hoist, stronger outrigger boxes and high alloy steel in hoist standards help raise crane capacity.

Three Separate Hydraulic Circuits Develop Powerful Precision Control Three independent circuits, each supplied by a separate pump, let you coordinate crane movements faster . . . and still maintain precision control. Pump drive is now enclosed and runs in oil for longer life. No maintenance or adjustment of V-belts required.

Selector Valves Increase and Concentrate Speed and Power Speed of any movement can be doubled while safely controlling other motions. You can direct flow of oil to where it is needed for added speed. Each circuit contains its own improved relief valve.

New 12-Volt System Assures Starts in Severe Weather Modern 12-volt electrical system is used to start independent power plant for quick starts in all climates.

These new, improved machines retain all the outstanding features of their popular forerunners . . . low-cost truck mounting (new or used), hydraulic telescoping boom, short tail swing, patented outriggers, open road speeds up to 50 mph. Three-piece boom extends to 50 feet, retracts to 26 feet to provide less than 35 feet overall length of truck for travel. See your Bucyrus-Erie Hydrocrane distributor for the whole story on the new H-5 Hydrocrane. 232H58

A Familiar Sign... BUCYRUS ERIE *...at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

inches in diameter. If sludge is to be pumped, a 6-inch pipe may be used except for the rodding line which should be 8 inches. A net static head of 6 feet should be provided for gravity withdrawal and 2 feet for pumping. Piping should be arranged to facilitate cleaning and should be sloped so that it will drain. Entrances to sludge withdrawal piping should be designed to prevent clogging. Valves should be located outside the tank for accessibility.

BOD removals are based on Fig. 1.

Equipment Available for Primary Tanks

Some of the equipment available for single story tanks for small plants is listed herewith: Link-Belt equipment can be furnished for settling tanks as small as 20 feet long by 8 feet wide. The Chain Belt rectangular clarifier is made as small as 20 feet long by 6 feet wide.

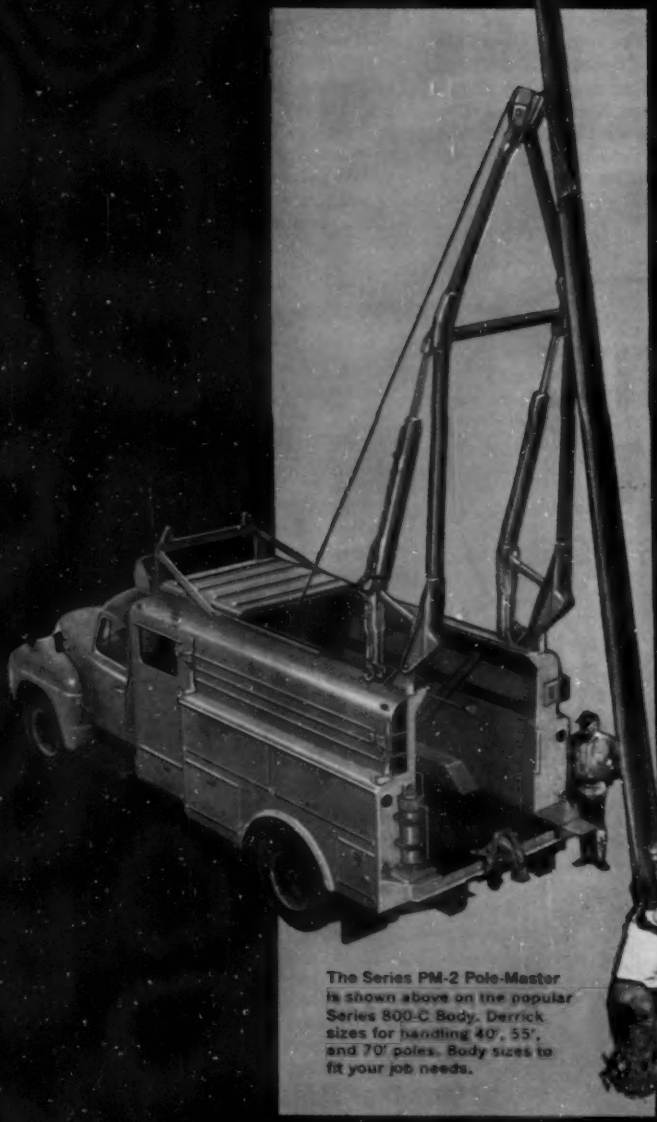
Ralph B. Carter Co. manufactures equipment for circular clarifiers with a 20-ft. minimum diameter. Hardinge has supplied circular clarifiers down to 16 feet in diameter. Lakeside Engineering "Spiraflo" clarifiers are available as small as 12 feet in diameter. Jeffrey makes equipment for rectangular tanks down to 10 feet wide and 20 feet long. Yeomans "Rim Drive" clarifier is made for tanks 15 feet in diameter and greater. This company also makes equipment for rectangular settling tanks. Infilco manufactures equipment for settling tanks in the small plant range. American Well Works furnishes equipment for small rectangular settling tanks.

Walker Process Co. makes equipment for both rectangular and circular sedimentation basins in the small plant range. Dorr-Oliver furnishes circular tank equipment as small as 12 feet in diameter and the "Duo-Clarifier" which provides primary and secondary tanks using the same sludge collecting mechanism, is also made as small as 12 feet in diameter.

Equipment Available— Two-Story Tanks

For two-story tanks, there is available the Lakeside "Spiragester" which represents that company's "Spiraflo" clarifier modified and placed above a sludge digestion compartment. Floating materials can be pumped into the digester compartment and sludge from the digester compartment can be recirculated. The manufacturer states that the action of the influent sewage in flowing around the race of the clari-

MUSCLES OF STEEL



The Series PM-2 Pole-Master is shown above on the popular Series 800-C Body. Derrick sizes for handling 40', 55', and 70' poles. Body sizes to fit your job needs.

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HYDRAULIC DERRICK

Touch a lever, and presto . . . powerful hydraulic cylinders raise Pole-Master from its carrying position and move it to any point within a 190-degree operating arc. Seconds later, you're all set to latch on to the load with the winch line and hoist away! To move the fully-powered Pole-Master under load, just flick the control lever again . . . that's all there is to it.

The detailed story of Pole-Master's many cost-cutting features is yours for the asking. Send for it today!

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Another reason why
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UTILITY BODIES AND EQUIPMENT

EARTH-MASTER HYDRAULIC HOLE DIGGER

Guided auger digs straight, clean holes in practically any soil . . . even frozen ground and hardpan. Digs as deep as 9' 4". Can be used at various angles, too.

fier assists in keeping the water surface and container surfaces clean as compared to the gas vents of Imhoff tanks.

The "Spiragester" is made as small as 8 feet in diameter with about 40 inches depth in the settling compartment and 145 cubic feet of settling capacity. The digester compartment may be made as deep as is required and may be heated. The manufacturer indicates that the bridge, center core and skirt may be lifted out by a crane, as complete units, to permit removal of sand or other material should this become necessary. If plant expansion becomes necessary then a fixed or floating cover may be placed on the unit and the tank heated to increase digestion capacity. The bridge, trough and skirt can then be placed in a separate tank of the same diameter.

A fully mechanized two-story tank is available in the Dorr-Oliver Clarigester. This unit provides mechanical sludge collection and skimming and mechanical mixing in the digestion compartment. The smallest diameter available is 12 feet and the settling compartment may be as shallow as 4 feet. Scum may be pumped to the digester and supernatant may be returned to the influent well. The digester compartment may be heated. The unit is also available as a "Duo-Clarigester" with primary and secondary settling in the same tank above a digestion compartment.

Another Dorr-Oliver development is a package plant called the "CompleTreator" which provides two-stage high-rate trickling filters for secondary treatment together with primary and secondary clarifiers and a digestion compartment. This type of plant, designed for flows up to 10,000 gallons per day, is completely housed in a tank 11 ft. 6 ins. in diameter and about 20 feet high.

• • •

Sewage Plant Design Conference

The Second Great Plains Sewage Treatment Plant Design Conference will be held on March 4 at the Castle Hotel, Omaha, Nebraska. The Conference, which is sponsored jointly by the Nebraska State Department of Health and the Nebraska Sewage and Industrial Wastes Association, will cover sewage analysis as applied to plant design, sedimentation tanks, vacuum filters, and industrial wastes. Additional information may be obtained from V. J. Lechtenberg, 614 Standard Oil Bldg., Omaha, Nebraska.

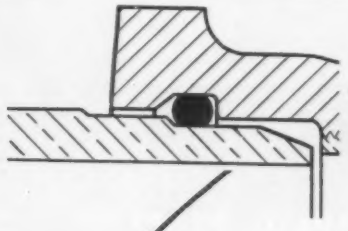
Industrial Waste Section N. J. Sewage & Industrial Waste Ass'n.

The annual meeting of the New Jersey Sewage and Industrial Waste Ass'n. will be held at Atlantic City March 12-14. The March 12 program for industrial wastes is as follows:

Morning Session on Neutralization of Acidic Wastes: Selection, Preparation and Application of Materials, Gordon J. Wiest; Problems of Process Control, Bruce W. Dickerson; Design of Neutralization Units, John J. Baffa; Sludge Handling and Other Problems, J. H. Morris.

Afternoon Session: Basis For State and Interstate Regulations on Discharge of Industrial Wastes, Robert S. Shaw; Treatment of Cyanide Wastes, A. E. Griffin and R. J. Baker; Information Required for Disposal of Chemical Industry Wastes, Robert W. Haywood, Jr.; Pollution Abatement an Inevitable Companion of Water Conservation, L. L. Hedgepeth.

James Lamb of American Cyanimid will moderate the morning session and A. E. Griffin of Wallace & Tiernan the afternoon session.



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RING-TITE ASBESTOS-CEMENT PIPE LINES

M&H

For installing M&H Valves and Hydrants in a Ring-Tite asbestos-cement pipe line, specify valves or hydrants with Ring-Tite end connections. The connecting ends of the valve or hydrant are especially designed to enclose a round rubber ring gasket when the end of Class 150 Ring-Tite pipe is inserted, as illustrated in sketch above. Non-rising-stem gate valves with Ring-Tite end connections are available either with conventional or "O"-Ring stuffing box.

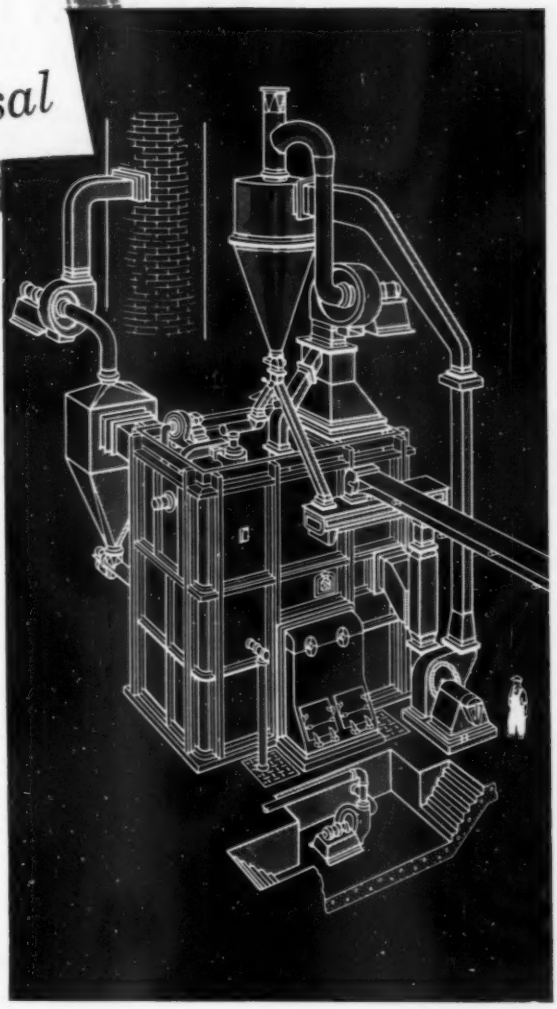
Installation is easy and simple. Unskilled workmen can make up the connection quickly and economically. No special fittings nor extra joint materials are required. The joint is tight against low or high pressure. For full information, wire or write

M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA

SUBSIDIARY OF W WALWORTH

THE C-E RAYMOND FLASH DRYING SYSTEM...

6 reasons why it's your best choice for sludge disposal



IT OFFERS THESE FUNCTIONS:

1. Drying... Only the C-E Raymond System gives you *controlled* drying. This means that your filter cake is reduced to particles uniform in size...low and uniform in moisture content...highly suitable for use as fertilizer when sludge characteristics permit.

2. Incineration... The Raymond System provides the simplest, most efficient method of sludge incineration. It produces a sterile ash that is free of clinkers...requires less purchased fuel.

3. Deodorizing... The C-E Raymond System is the only one that offers high temperature deodorization to remove foul odors from combustion gases, as well as from sludge holding tanks.

WITH THESE FEATURES:

4. Superior Structure... Instead of relying on multiple refractory arches, the C-E Raymond System utilizes small groups of arch bricks individually hung from steel supports above and outside the furnace. This not only makes arch failure virtually impossible, but permits very rapid start-ups and shut-downs... offering important man-hour and fuel savings.

5. Economical Operation... This system has a proved record of low maintenance costs. Not only is maintenance negligible, but the revenue gained from the sale of flash-dried sludge as fertilizer can help pay the operating costs of your plant.

6. Proved Dependability... More than a quarter of a century of use and development in plants throughout the United States and abroad has shown the capability of the C-E Flash Drying System.

More filter cake is dried and/or burned in this system than by all other systems combined.

For detailed information on the C-E Raymond Flash Drying System, and how it can benefit your community, contact the Combustion office nearest you. A C-E specialist will be glad to discuss your requirements with you or your consultants.

COMBUSTION ENGINEERING

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C-E

C-1078

ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

RADIOLOGICAL DECONTAMINATION of PAVEMENTS and ROOFS

LT E. E. SHALOWITZ
and
LTJG W. F. GLOVER,
Civil Engineer Corps,
U. S. Naval Reserve

TO FURTHER the knowledge of radiological decontamination, the Bureau of Yards and Docks and the Army Chemical Corps recently co-sponsored a series of tests at Camp Stoneman, Calif. These tests, under the technical direction of the U. S. Naval Radiological Defense Laboratory, were designed to yield information on the cost, rate, and effectiveness of some of the presently accepted methods for radiological decontamination of paved areas and roofing materials.

Two types of radioactive fallout were simulated in this operation: a dry type, simulating the type of fallout that would occur from a land surface or subsurface detonation; and a slurry type, representing fallout that would result from a harbor detonation. The bulk carrier materials used were processed soil from Camp Stoneman and processed San Francisco Harbor bottom mud for the dry and slurry simulants respectively. Onto these soils was absorbed lanthanum 140 (La^{140}), a radioactive isotope with a half life of 40 hours. With the La^{140} used as a tracer, radiation intensities of 10,000 and 1,000 roentgens per hour at one hour after burst were simulated by dispersing ½ and 1/20 pound of contaminant material respectively, per square foot of surface area.

Every other day of the operation, two capsules of La^{140} (in the oxide form) were shipped from the Materials Test Reactor in Idaho via an Air Force plane to Travis Air Force Base and then to Camp Stoneman by truck. To protect personnel from radioactivity, the capsules were encased in lead containers during shipment and storage. Upon arrival, one capsule was broken in a special apparatus set up on one side of a 3-foot thick, concrete shielding wall fitted with a zinc bromide window. Personnel preparing the La^{140} operated the apparatus from the protected side of the wall by using master slave manipulators. After the capsule was broken, hydrochloric acid was pumped into the apparatus and it reacted with the capsule contents to form lanthanum chloride. This solution was then diluted with water, filtered, and pumped into a bottle attached to the side of a transit mix truck. The truck had been filled with a predetermined amount of bulk carrier material and as the drum revolved, the lanthanum solution was sprayed onto the bulk carrier material by means of an atomizing nozzle located inside the drum. The fallout simulant prepared in this manner was used the following day. The second capsule was broken on the following day and similarly prepared.

On the morning following the preparation of the simulant, the mixture was placed either in a dump truck equipped with a modified spreader attachment for dry contaminant dispersal or in a modified crash trailer which contained sufficient water to produce a slurry contaminant. A spray boom was attached to the crash trailer to disperse the slurry contaminant over paved areas. Hand-drawn cart dispersers were used to spread both the dry and slurry contaminants over roof areas and test panels.

Monitoring and Decontamination

The test surfaces were monitored before contamination, after contamination, and after decontamination. Three instruments were used: a shielded or collimated probe, an unshielded probe and field instruments of type AN/PDR-27F. Approximately twenty reading points were monitored in each of the 20-ft. by 200-ft. paved areas. On the roof areas and test panels only the unshielded probe and field instruments were used. The monitoring measured the radiation intensities of the test areas. Generally speaking, the ratio of the monitored reading of an area after decontamination to that before decontamination gives the percent of contaminant remaining or the effectiveness of the procedure.

On concrete and asphalt test areas the following decontamination procedures were tested: firehosing, firehosing plus scrubbing (with and without detergents), motorized flushing, and motorized flushing plus motorized scrubbing (with and without detergents). Firehoses (1½-inch) were used for manual flushing and long handled, stiff bristled brushes for manual scrubbing. Motorized flushing was done with a standard street flusher and motorized scrubbing with a standard street sweeper. The detergent used in conjunction with manual and motorized scrubbing was an ordinary household type.

When scrubbing was employed, it followed a flushing of the area and was itself followed by a final rinse. The rate of progression of firehosing was determined by visual inspection. Motorized flushing was performed at speeds less than five miles per hour.

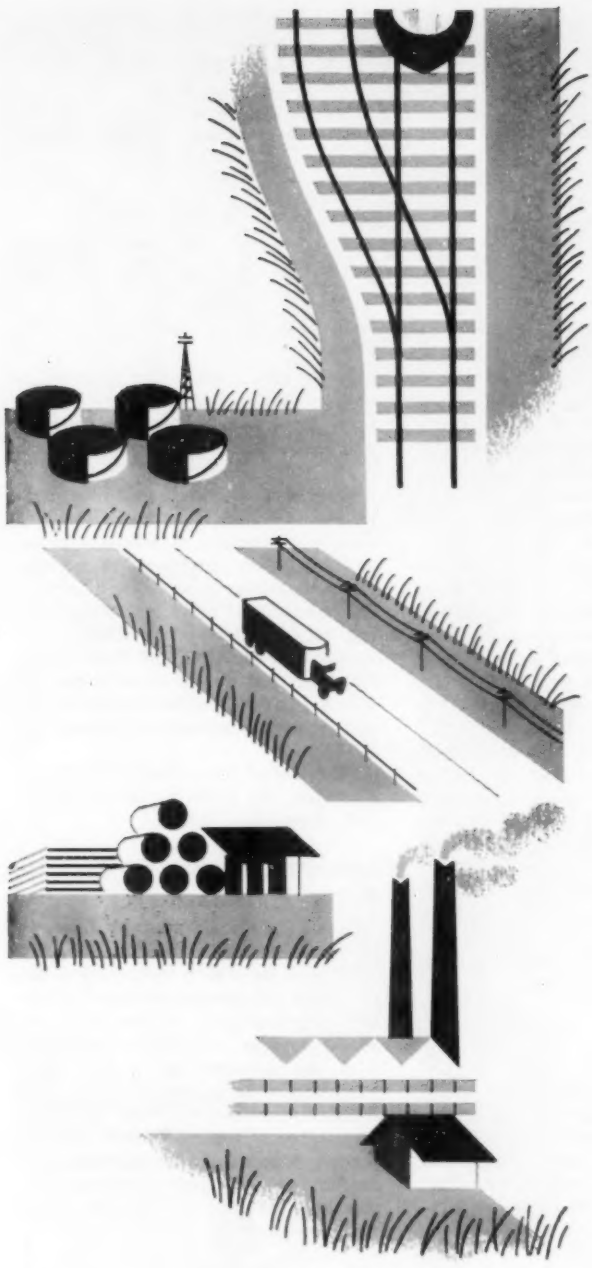
All of the data, when analyzed and interpreted, will add to the state of knowledge of radiological decontamination and, in so doing, will provide information that will increase the accuracy and reliability of passive defense planning for both civilian and military installations ashore. *Condensed from the U. S. Navy Civil Engineer Corps Bulletin, September, 1957.*

• • •

Wisconsin Highway Program

The Wisconsin highway construction program for 1958 totals $133,950,900. For the general State Trunk Highway System and federal aid urban work, the 1958 program is $44,036,600. For the National System of Interstate and Defense Highways $79,914,300 is programmed. These are the roads of freeway character for which the 1956 Federal Highway Act provides 90 percent federal financing. Wisconsin has 452 miles on the Interstate System.

In the 1958 program, $12 million on the Interstate System will be used for preliminary work such as engineering and acquisition of rights-of-way for future construction and $67 million for construction work.



announcing . . .

Geigy

SIMAZIN* 50W

a new pre-emergence herbicide

Now available for long residual control of grassy and broadleaf weeds in driveways, roadways, railroads, walks, paths, industrial sites, around buildings and other non-cropped areas.

NOW YOU CAN STOP WEEDS BEFORE THEY START with Geigy's amazing new pre-emergence herbicide Simazin 50W. Think what *preventive* weed control with Simazin 50W can mean in terms of time and money saved for industries, municipalities, highway commissions, railroads, utilities and any other business or service concerned with the problem of weed control on non-cropped areas.

How Simazin 50W Acts

Simazin 50W, a triazine compound, is not a contact or foliage herbicide, but acts on the plant roots, and should be applied just before germination or emergence for best results. Before using Simazin 50W for long residual weed control, existing plant growth should first be removed by use of a contact herbicide, or by mowing or ploughing under.

Long-Residual, Economical

One pre-emergence application of Simazin 50W applied at the rate of 10 lbs. per acre controls most grassy and broadleaf weeds for about a year. The material is economical and easy to use. At the maximum rate of application, less than ½ lb. is required to treat 1,000 sq. ft.

Controls a Variety of Weeds

Simazin 50W controls a wide variety of grasses and broadleaf weeds including barnyard grass, witch grass, yellow foxtail, wild oats, crabgrass, broadleaf plantain, dandelion, lamb's quarters, pigweed, ragweed, nightshade, purslane, velvetleaf and mustard.

Low Toxicity, Non-Corrosive

Simazin 50W has very low toxicity to humans and domestic animals. It is non-corrosive and can be removed from spraying equipment by merely flushing thoroughly with water.

No Lateral Leaching

Since there is practically no lateral leaching, Simazin 50W can be used adjacent to crop land and ornamental areas. Lack of phytotoxicity to foliage minimizes drift hazard.

Availability

Geigy Simazin 50W, containing 50% active ingredient is available in cases of 10 x 5 lb. bags and 50 lb. fiber drums.

Free Technical Bulletin

Send for your free copy of the Simazin Technical Bulletin and descriptive pamphlet. Address Department PW-28.

*"SIMAZIN" is a trademark of Geigy Chemical Corporation

ORIGINATORS OF Geigy DDT INSECTICIDES

GEIGY AGRICULTURAL CHEMICALS • *Division of Geigy Chemical Corporation* • **Saw Mill River Rd., Ardsley, New York**

PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Foretelling Water Shortages

Water shortages may exist because of inadequate treatment or distribution facilities; or there may be a shortage of basic supply, which is generally much more expensive and time-consuming to overcome. Early warnings are, therefore, essential and the author outlines a method of keeping records so as to give advance information of an impending shortage. These involve regular tabulations covering year-to-year population, average pumpage and maximum day and maximum hour consumption. A method of constructing area-capacity curves for a reservoir is illustrated by an example; also the construction of a curve showing demand vs safe yield. The minimum water use records required are tabulated as a guide to record-keeping.

"What A City Can Do to Foretell a Water Shortage." By Karl F. Hoefle. PUBLIC WORKS, January, 1958.

Artificial Earthquakes

In an investigation of ground water supplies in Plymouth and Bristol Counties in Massachusetts, a special commission decided that a study of existing wells should be conducted, along with a review of the data on the geology of the area. Since the geology of any area in Massachusetts may be divided into two parts: (1) The geology of the bedrock, and (2) the geology of the unconsolidated deposits overlying the bedrock, the commission decided that the field work should be done which would include seismic soundings to determine the depth of bedrock as well as the mapping of surficial geology. The direct object of the geophysical exploration is to uncover so-called buried bedrock valleys which may have been formed in the area during the glacial period. These valleys were subsequently filled with glacial deposits of a pervious nature as the glacier melted and do not necessarily follow the contour of the present surface valleys and streams. There are two methods of seismic surveying of subsurface conditions, namely, the seismic reflection method and the seismic refraction method, the latter being used in this investigation. It is based primarily on the measurement of the time of advance of a wave front generated by an explosion. This measurement is made by timing the arrival of a wave front at various instruments placed in progression away from the explosion. In search for an underground source of water, the seismic method points out the geological conditions that are likely to produce water. This often-times eliminates a great deal of needless drilling in search for the proper underground conditions where water may be obtained.

"Artificial Earthquakes Used in Seismic Survey for Ground Water." By Paul C. Ross. *Water Works Engineering*, December, 1957.

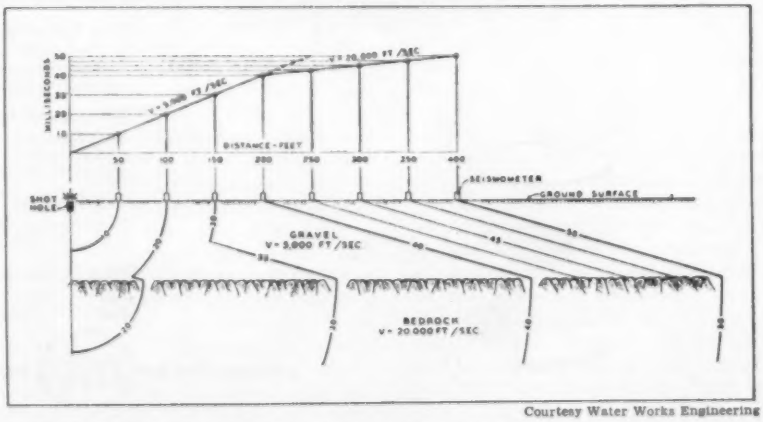
Taste and Odor Control

To provide data on current practice in taste and odor control, questionnaires were sent to cities of 25,000 population and over. These indicated that algae were a principal problem in 198 of 241 plants reporting, or 82%. Decaying vegetation was next with 67%; trade wastes were reported by 38%; and other causes by 25%. Of the 241 plants, 82% run odor tests. Preventive measures are quite generally employed, as copper sulfate control of algae, elimination of swampy areas and adequate treatment of wastes. An interesting summary of corrective treatments used by the reporting cities is given, covering activated carbon, used by 221 cities; free residual chlorination, used by 158; super and dechlorination by 34; chlorine dioxide by 70; and aeration by 55.

"Control of Odor Control in Water Supplies." By E. A. Sigworth. *JAWWA*, December, 1957.

Edmonton Treats Glacier Water

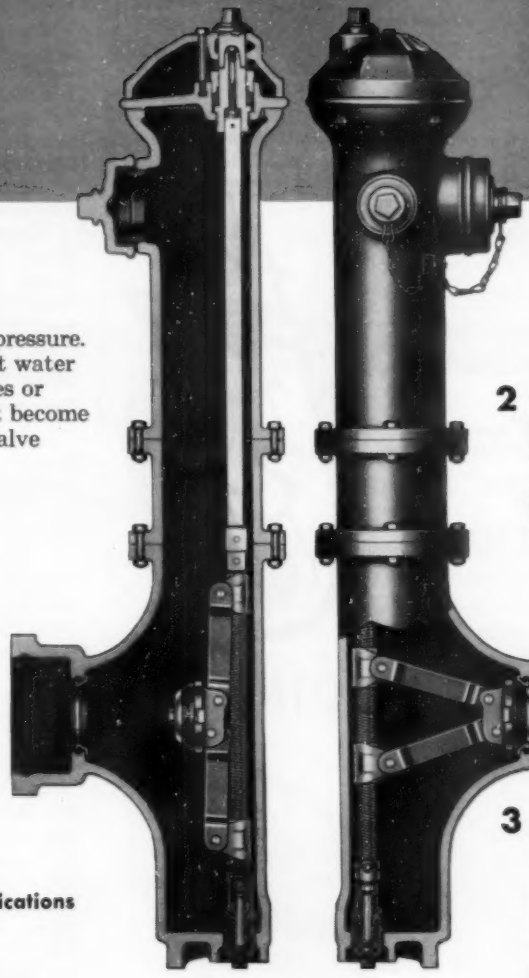
The City of Edmonton, Alberta, in the Canadian West, has recently expanded its water treatment plant to supply its own population of 238,353, together with a population of 24,000 on its immediate outskirts, with an average per capita consumption of 90 gallons per day. The North Saskatchewan River provides the source of water, its head waters being supplied from glaciers the largest being the Saskatchewan Glacier at a distance of 315 miles from



Courtesy Water Works Engineering

● **WAVE front generated by explosion points to areas likely to produce water.**

Here is why farsighted city officials install IOWA fire hydrants



1 FAST WATER
Opens fast, with the pressure. Closes slowly, without water hammer. Sticks, stones or foreign matter cannot become lodged between the valve and valve seat.

2 FULL FLOW
When hydrant is fully opened, valve and stem are entirely clear of the waterway. This permits free and unobstructed flow of water.

OPEN

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IOWA HYDRANTS AND VALVES
meet all A.W.W.A. specifications

3 EASY MAINTENANCE
All internal working parts are attached to the valve stem, which is easily lifted out when dome and head are removed. Common wrench and screwdriver only tools required. No special tools are needed.

Let us send you details on Iowa's complete line of valves and hydrants

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the city. The proportion of glacier water varies from about 14 per cent in April to about 56 percent in July. Heavy rains and melting snow leach out organic materials from the vegetation, giving rise to offensive tastes and odors. It is not unusual to get a color of up to 360 ppm during the spring thaw, primarily from organic compounds containing iron. The water treatment plant receives its entire water needs all winter at a temperature of 63°F by using recirculation water pumps. Stated simply, this means that the municipally owned power plant uses river water for steam turbine condensers, then pumps the used water to the water treatment plant all winter thereby eliminating frost difficulties even though the outdoor temperatures drop as low as 50° F below zero. The 63° F water aids the entire softening process—a cold process lime soda-ash treatment—and it also aids materially in the formation of a good alum floc for coagulation. Alum, soda ash, ammonium sulfate and activated carbon are all received in bags, the bags being placed upon pallets at the commercial supplier. The pallets are hauled to the plant by truck and then transferred to the second floor of the warehouse by means of a two-ton hoist where an electrically operated fork lift truck picks up the pallet and stores it two-high in the storage space. Carbon slurry feed equipment is being installed, and a sodium chlorite feeder to work in conjunction with one of the chlorinators to generate chlorine dioxide will be installed before the spring thaw of 1958 in an attempt to reduce taste and odor-producing phenols. The filters, designed to operate at a normal rate of 2 Imperial gallons per square foot per minute can, by means of a simple adjustment, operate at a rate of 5 gallons per square foot per minute and supply a water of excellent quality to the consumer.

"Canadian City Treats Glacier Water in Plant of Unique Automatic Design." By E. L. Smith. *Water Works Engineering*, December, 1957.

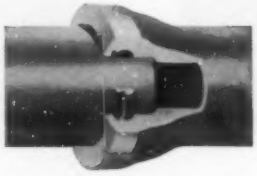
Suburbs Pay For Extensions

By 1950, 98% of the residentially suitable area within the corporate limits of Fort Wayne, Indiana, had been developed and the only direction left for expansion of the city and its water distribution system was outward. A workable method was developed to finance the cost of supplying city water to these growing fringe areas. It has always been a requirement that new customers make a cost contribution to water main extensions. In 1946, the city conceived and developed a contract between the customer and the water works whereby the customer paid all costs for a main of sufficient size to serve his needs, but with a four-year estimated revenue equivalent refund by the utility, with the utility bearing the cost of oversizing. A still more recent type of contract is explained in detail in this article. The author has chosen a specific fringe area to explain the basis for the newest concept of a main extension policy. The first proposed large section to receive this treatment is an area of 11.5 square miles in St. Joseph Township. Routes chosen for the water mains are on existing county roads, the grid system following main roads at one-mile section lines, or at half-section lines, if deemed necessary. Housing projects planned in the near future are located. From these areas, the water utility expects to receive early contributions on a square foot basis to apply against the outlay of cash in initiating the first step. During 1956, the water utility

"I jist sez:
'Boss, we done run out of TYTON'—
and he hit the ROOF!"

McWANE *TYTON JOINT
cast iron pipe

No wonder pipe laying crews like McWane Tyton Joint pipe—it's so easy to lay. Just push the joint together. The only joint accessory is the gasket. Eliminates bell holes. Reduces construction costs. Joint is leakproof and flexible to allow for settlement, expansion or contraction. Hydrostatic tests prove the joint withstands pressures exceeding those required by standard pipe specifications. Approved by ULI in 4" and larger sizes. Furnished 2" and 2½" in 20-foot lengths, 4" through 12" in 18 foot lengths. Prompt shipment.



Cutaway to illustrate position of Tyton gasket inside assembled joint.

*Patent pending, trademark ®

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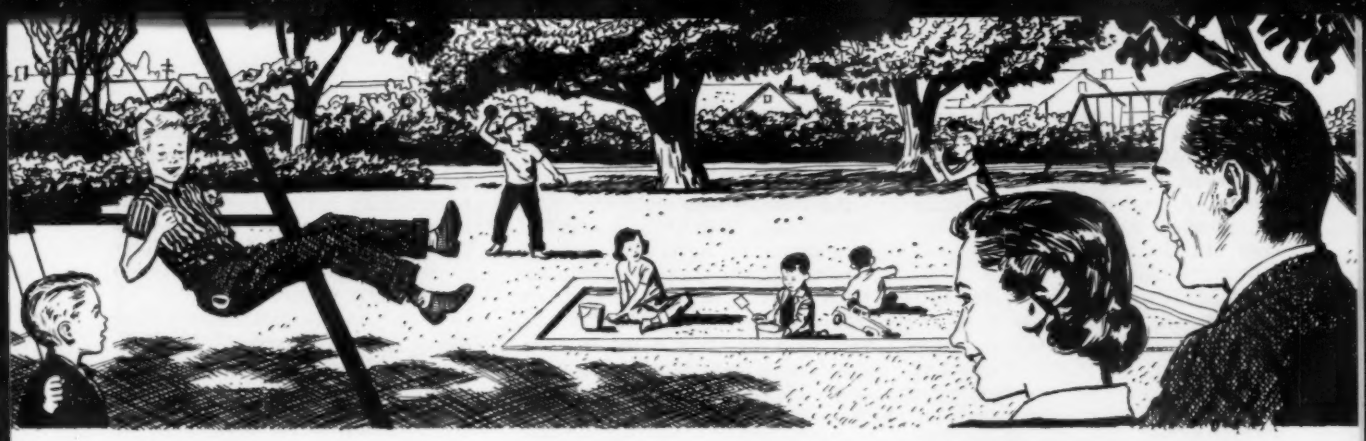


Playgrounds assured...

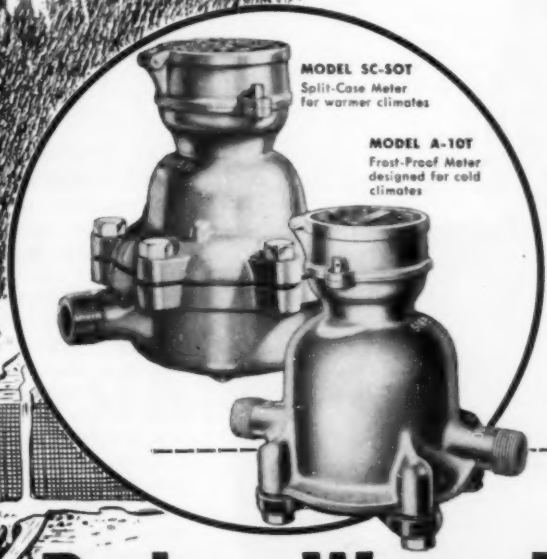
but what about their most precious possession...water?

Protect your community's water and future...with Badger Meters

Recreation facilities are an asset to your community. That's why you willingly allocate funds for their expansion. But what about water supplies? They're *vital* to community existence. Yet many communities are retarded in their growth because there just isn't enough water for expansion.

You can start conserving water and insure your community's future *now*. With Badger Meters, every consumer is assessed fairly for water used or wasted. This fair-share, fair-pay plan stops water waste . . . assures future supplies for community growth. And when water waste stops . . . conservation begins.

Precision-engineered from the finest alloys for lasting, dependable efficiency, Badger Meters put your water system on a profitable business basis. Whether your system requires disc, turbine or compound meters—you can choose the right type from the complete Badger Meter line—in sizes from $\frac{5}{8}$ in. through 12 in. Ask your Badger Meter representative for facts — or write for literature *today*.



Badger Water Meters

Water is vital

Badger Meters have conserved it better for over 50 years

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submitted a revised policy on water main extensions which was approved by the board of public works. A condensation of this policy is included. Adoption of this policy has put the utility in the role of advancing the money for the development of feeder mains for the outlying areas. An aerial survey of the city and environs has also been made during the past year enabling the utility to have contour maps made photogrammetrically.

"How Fort Wayne's Suburbs Pay for Extension of City Water Mains." By H. A. Kerby. *Water Works Engineering*, December, 1957.

Water and Sewerage for A Residential Development

An entirely new residential community near West Palm Beach, Fla., is planned for an ultimate population of 25,000. Water supply comes from a well field three miles inland from the ocean and is brought to the area by a pipe line 16 ins. in diameter, with a 12-in. line passing under Lake Worth and the Intracoastal Waterway to supply ocean front property. The water has a color of 70, hardness in excess of 300 mg/l, and appreciable amounts of CO_2, iron, hydrogen sulfide and sodium chloride. These are removed or reduced in a modern treatment plant with automatic controls and a telemetering system controlling the high service pumps. The sewage treatment plant is of the biofilter type with separate sludge digestion and standby power.

"Water and Sewerage for a New Residential Development." By C. E. Wright. PUBLIC WORKS, January, 1958.

Other Articles

"Some Water and Sewage Works **Legal Problems.**" By John H. Murdock, Jr. Water and Sewage Works, December, 1957.

"**Water Works Management**, Water Conservation, and Public Relations." By Frank C. Amsbary, Jr. Water and Sewage Works, December, 1957.

"**Automatic Control** of Pumping Stations." By J. S. Williams. Water and Sewage Works, December, 1957.

"How to Design and Operate **Rapid Sand Filter** Facilities." By Rolf Eliassen and E. Alan Cassell. Water Works Engineering, December, 1957.

"Elevated Water **Tank Defies Tornado.**" By Clarence D. Miller. Civil Engineering, December, 1957.

"Louisville **Doubles Water Plant** Capacity." By Henry M. Gerber. The American City, December, 1957.

"Survey of **Water Purification Practice** in Canada." By DeLoss H. Matheson and A. V. Forde. JAWWA., December, 1957.

"A **Statistical Analysis** of Water Works Data for 1955." By Harris F. Seidel and E. Robert Baumann. JAWWA., December, 1957.

"Summary of **1955 USPHS Survey** of Treatment Facilities in Communities of 25,000 and Over." By Ralph Porges. JAWWA, December, 1957.

"Evaluation of the Use of **Polyphosphates** in the Water Industry." By Thurston E. Larson. JAWWA., December, 1957.

• • •

Traffic Engineering Fellowships and Scholarships

A number of fellowships and scholarships in Traffic Engineering at the Yale Bureau of Highway Traffic are available for the academic year starting in September, 1958. These awards are open to engineering graduates who wish to pursue professional careers in the field of street and highway planning, design and operations.

Fellowships are awarded on a competitive basis and provide tuition and a living stipend of $175 each month during the academic year. Applications may be obtained from the Director, Bureau of Highway Traffic, Yale University, Strathcona Hall, New Haven 11, Conn. Closing date for filing fellowship applications is March 1, 1958.

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Use HTH in either form for sure elimination of bacteria, algae, fungi and odors from reservoirs, wells, mains, spray ponds, filters and other danger spots.

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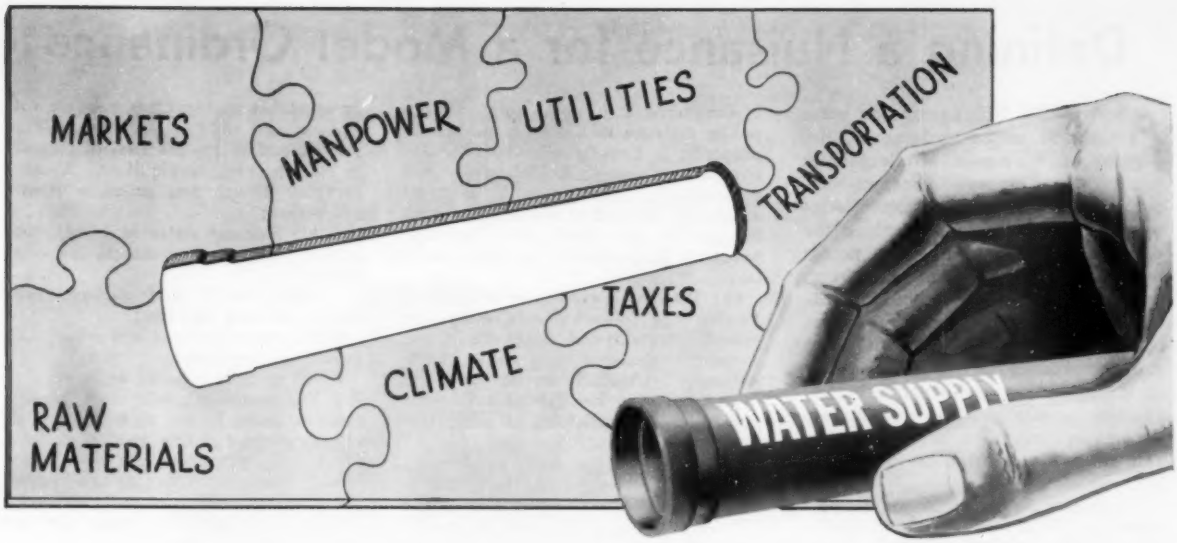
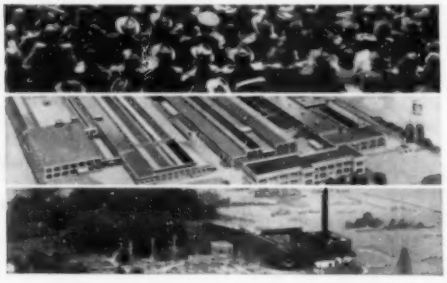


Foremost Factor in Community Progress an Adequate **WATER SUPPLY**

"The future pattern of regional growth and development will depend upon the wisdom and foresight of these many State and local areas in developing and allocating water resources for optimum benefit," says the U. S. Department of Commerce in its Bulletin, "Water Use in the United States, 1900-1975."

Projecting future water uses by major categories, this same authority estimates that:



POPULATION served by public water supplies will grow from 111 million in 1955 to 148.8 million in 1975, an increase of 34%.

INDUSTRIAL AND MISCELLANEOUS daily average water uses will grow from 60 billion gallons in 1955 to 115.4 billion gallons in 1975, an increase of 92.3%.

STEAM ELECTRIC POWER PLANTS using 59.8 billion gallons daily average in 1955 will use 131.0 billion gallons in 1975, an increase of 119%.

In summation, the total daily average of all these uses is estimated to grow from 262.04 billion gallons in 1955 to 453.08 billion gallons in 1975, an increase of 72.9%.

Many progressive communities throughout the U.S.A. are foresightedly expanding their waterworks systems in anticipation of largely increased water use. In the overwhelming majority of these cities, the pipe used for water system extensions is:

***Permanent* CAST IRON PIPE** *"America's No. 1 Tax Saver"*

— because informed officials know it will give the greatest return in terms of century-long, trouble-free service and efficient operation under *all* conditions.

Our Company does not manufacture pipe but has long supplied the nation's leading cast iron pipe manufacturers with quality iron from which quality Cast Iron Pipe is made.

WOODWARD IRON COMPANY
Since 1882
WOODWARD, ALABAMA

Defining a Nuisance for a Model Ordinance

AS A PART OF A proposed basic code of model ordinances, the League of Wisconsin Municipalities has prepared an ordinance on nuisances which features a series of useful definitions. In presenting the ordinance, *The Municipality* points out that "specific enumeration in an ordinance of the most common nuisances will provide a guide for enforcement officials. In doubtful cases the declaration of the municipality in a nuisance ordinance often controls the determination of whether or not a thing or act is a nuisance. . ." The section on definitions is as follows:

(a) Public Nuisance. A public nuisance is a thing, act, occupation, condition or use of property which shall continue for such length of time as to: 1. Substantially annoy, injure or endanger the comfort, health, repose or safety of the public; 2. In any way render the public insecure in life or in the use of property; 3. Greatly offend the public morals or decency; 4. Unlawfully and substantially interfere with, obstruct or tend to obstruct or render dangerous for passage any street, alley, highway, navigable body of water or other public way.

(b) Public Nuisances Affecting Health. The following acts, omissions, places, conditions and things are hereby specifically declared to be public health nuisances, but shall not be construed to exclude other health nuisances coming within the definition of subsection (a) of this section:

1. All decayed, harmfully adulterated or unwholesome food or drink sold or offered for sale to the public;

2. Carcasses of animals, birds or fowl not buried or otherwise disposed of in a sanitary manner within 24 hours after death;

3. Accumulations of decayed animal or vegetable matter, trash, rubbish, rotting lumber, bedding, packing material, scrap metal or any material whatsoever in which flies, mosquitoes, disease-carrying insects, rats or other vermin may breed;

4. All stagnant water in which mosquitoes, flies or other insects can multiply;

5. Privy vaults and garbage cans which are not fly-tight;

6. All noxious weeds and other rank growth of vegetation;

7. All animals running at large;

8. The escape of smoke, soot, cinders, noxious acids, fumes, gases, fly ash or industrial dust within the (city) (village) limits or within one mile therefrom in such quantities as to endanger the health of persons of ordinary sensibilities or to threaten or cause substantial injury to property;

9. The pollution of any public well or cistern, stream, lake, canal or body of water by sewage, creamery or industrial wastes or other substances;

10. Any use of property, substances or things within the (city) (village) limits or within 4 miles thereof, emitting or causing any foul, offensive, noisome, nauseous, noxious, or disagreeable odors, effluvia or stenches extremely repulsive to the physical senses of ordinary persons which annoy, discomfort, injure or inconvenience the health of any appreciable number of persons within the (city) (village);

11. All abandoned wells not securely covered or secured from public use.

(c) Public Nuisances Offending Morals and Decency. The following acts, omissions, places, conditions and things are hereby specifically declared to be public nuisances offending public morals and decency, but such enumeration shall not be construed to exclude other nuisances offending public morals and decency coming within the definition of subsection (a) of this section;

1. All disorderly houses, bawdy houses, houses of ill fame, gambling houses and buildings or structures kept or resorted to for the purpose of prostitution, promiscuous sexual intercourse or gambling;

2. All gambling devices and slot machines;

3. All places where intoxicating liquor or fermented malt beverages are sold, possessed, stored, brewed, bottled, manufactured or rectified without a permit or license as provided for by the ordinances of the (city) (village);

4. Any place or premises within the (city) (village) ordinances or state laws relating to public health, safety, peace, morals or welfare are openly, continuously, repeatedly and intentionally violated;

(d) Public Nuisances Affecting Peace and Safety. The following acts, omissions, places, conditions and things are hereby declared to be public nuisances affecting peace and safety, but such enumeration shall not be construed to exclude other nuisances affecting public

San Diego to be Host City for 1958 Western Area Public Works Conference

Richard Gallagher, General Chairman of the 1958 Western Area Public Works Conference, has announced that San Diego, California, will be the center for the Spring Conference of the Western Area of the American Public Works Association. Long recognized as an outstanding convention city, San Diego will host the conference June 15-18.

Invitations are being sent to the 1,000 members in 200 cities in the 11 western states, Alaska, Hawaii, western Canada and northern Mexico. The league of California Cities has indicated that it will participate with its mid-year meeting of Public Works officials. It is expected that the League of Cities of the various states will participate.

John W. Davis, Assistant County Road Commissioner and Chairman of the Equipment and Materials Show, has had enthusiastic support from the Equipment and Materials dealers. It is planned to have working demonstrations at the City's sanitary fill site in Balboa Park to give the members a preview of what is to come by way of industrial equipment.

One of the features of the sessions will be a Round Table Breakfast from 7:30 to 9:15 a.m. each morning of the conference. These will be planned to provide a round-up of information from the various sessions held the preceding day and should prove useful and informative. The registration will include these three breakfasts, a dinner-dance to be held Tuesday night, one luncheon and a barbeque.

The Program Committee, headed by Norman Beenfeldt of the California Water and Telephone Company, promises to have an outstanding and informative program. Carleton Peterson, Superintendent of Maintenance and Operation of San Diego's Water Department, is chairman of the Entertainment Committee. He is working with the San Diego Convention and Tourist Bureau for well planned and organized events. The Housing Committee, headed by Ed Gabrielson, City Engineer's Department, has arranged for adequate housing at El Cortez Hotel, conference headquarters.

Pre-conference registration started in January and it is expected that because of the program and San Diego's reputation of being an outstanding host city there will be a record attendance.

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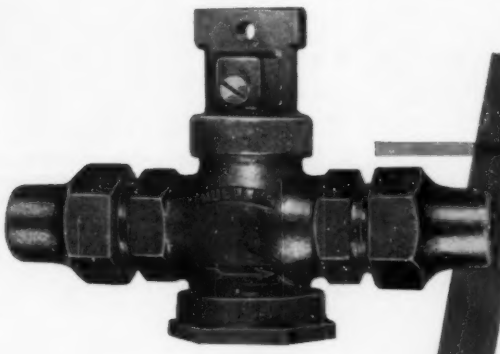
inverted key curb stops



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DESIGN

Steeper key taper provides easier operation. Water pressure exerts an upward force for additional seating action. A downward tap unseats and pressure reseats the key.

MATERIALS

All parts – body, key, coupling nuts, base caps, combined cap and tee, etc. – are cast from high-quality bronze. Leak-proof gasket around base cap prevents leakage.

WORKMANSHIP

All machining is to exacting tolerances. Bodies and keys are precision-fitted and individually lapped. Every stop is tested with air pressure under water.

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Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

peace or safety coming within the provisions of subsection (a) of this section;

1. All ice not removed from public sidewalks and all snow not removed from public sidewalks within 12 hours after it has ceased to fall thereon;

2. All signs and billboards, awnings and other similar structures over or near streets, sidewalks, public grounds or places frequented by the public, so situated or constructed as to endanger the public safety;

3. All buildings erected, repaired or altered within the fire limits of the (city) (village) in violation of the provisions of the ordinances of the (city) (village), relating to materials and manner of construction of buildings and structures within said district;

4. All unauthorized signs, signals, markings or devices which purport to be or may be mistaken as official traffic control devices placed or maintained upon or in view of any public highway or railway crossing;

5. All trees, hedges, billboards or other obstructions which prevent persons driving vehicles on public streets, alleys or highways from obtaining a clear view of traffic when approaching an intersection or pedestrian crosswalk;

6. All limbs of trees which project over a public sidewalk, less than 8 feet above the surface thereof or less than 10 feet above the surface of a public street;

7. All use or display of fireworks except as provided by the laws of the state of Wisconsin and ordinances of the (city) (village);

8. All buildings or structures so old, dilapidated or out of repair as to be dangerous, unsafe, insanitary or otherwise unfit for human use;

9. All wires over streets, alleys or public grounds which are strung less than 15 feet above the surface of the street or ground;

10. All loud, discordant and unnecessary noises or vibrations of any kind;

11. The keeping or harboring of any animal or fowl which by frequent or habitual howling, yelping, barking, crowing or making of other noises shall greatly annoy or disturb a neighborhood or any considerable number of persons within the (city) (village);

12. All obstructions of streets, alleys, sidewalks or crosswalks and all excavations in or under the same, except as permitted by the ordinances of the (city) (village) or which, although made in accordance with such ordinances, are kept or maintained for an unreasonable length of time after the purpose thereof has been accomplished;

13. All open and unguarded pits, wells, excavations or unused basements freely accessible from any public street, alley or sidewalk;

14. All abandoned refrigerators or iceboxes from which the doors and other covers have not been removed or which are not equipped with a device for opening from the inside;

15. Any unauthorized or unlawful use of property abutting on a public street, alley or sidewalk or of a public street, alley or sidewalk which causes large crowds of people to gather, obstructing traffic and free use of the streets or sidewalks;

16. Repeated or continuous violations of the ordinances of the (city) (village) or laws of the state of Wisconsin relating to the storage of flammable liquids.

• • •

Helping to Control Smog

A smog control ordinance has been adopted by Los Angeles, Calif., which prohibits the use of some million and a half home incinerators within an area of 5,000 square miles. An estimated 9,000 tons of trash were burned daily in these incinerators which were thought to contribute as much as one-third to the smog. Public or private services now will collect the trash and either bury or burn it in smokeless incinerators. The principal source of air pollution, automobile exhaust fumes, still is being studied intensively.

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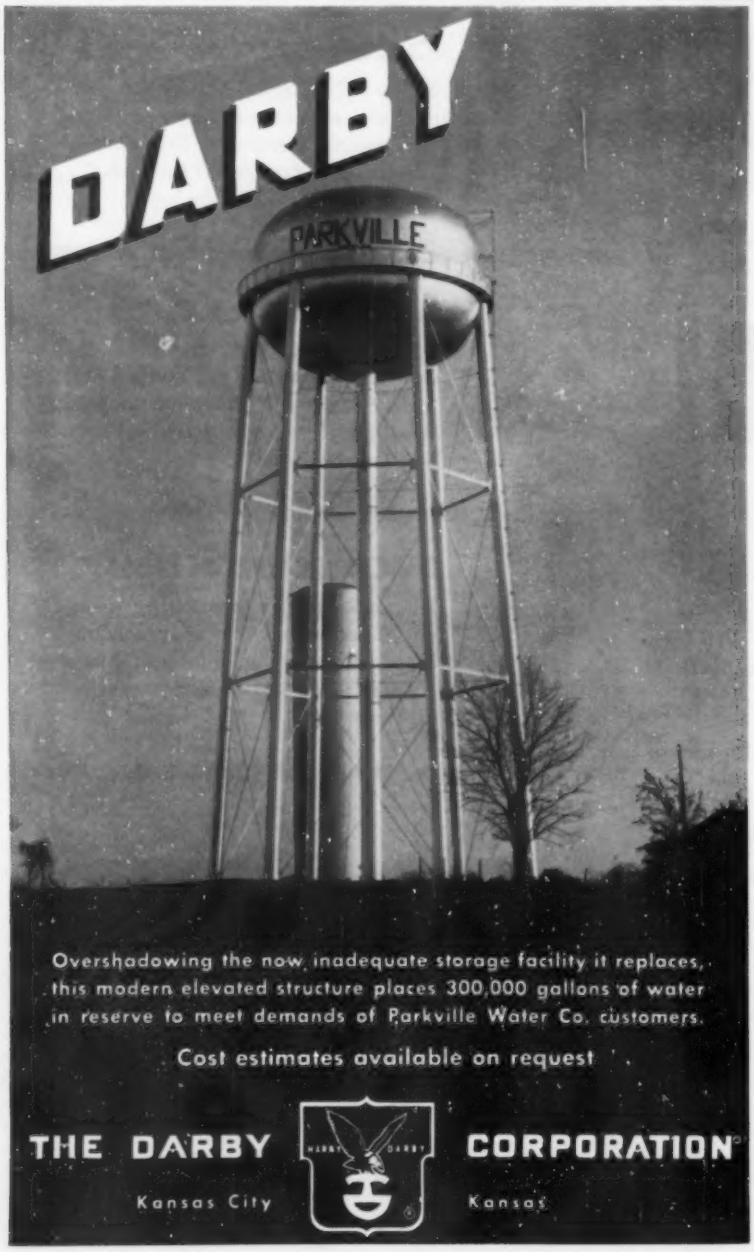
Anti-Litter Educational Program

Minnesota reports 126 fewer truckloads of litter collected from state highways in the first half of 1957 than in the first half of 1956. The reduction is ascribed to an anti-litter educational campaign.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PARKVILLE
Overshadowing the now inadequate storage facility it replaces, this modern elevated structure places 300,000 gallons of water in reserve to meet demands of Parkville Water Co. customers.
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Kansas

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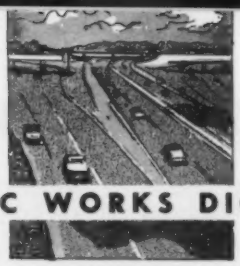

PUBLIC WORKS DIGESTS

Prepared by

FRANK FORCE

Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

Crash-Barrier Tests On Multiflora Rose Hedges

The facts from tests show that a multiflora rose hedge can safely stop an automobile, moving at 50 mph, in a distance of about 75 feet on the path of travel. At an approach angle of 20°, under such circumstances, a hedge 40 ft. wide would be needed to stop the vehicle. Crash barriers, however, are likely to be fully and economically useful only under special conditions. The initial planting cost and the cost of pruning and replacement may not be insignificant. Hedges, particularly of the thorny multiflora rose, accumulate a great deal of trash, paper and other litter, which may be more expensive to remove than on a grassy median. Medians are often used, in the Northern States, for storage of snow plowed off the pavement, and the hedges may necessitate a different snow-removal practice. Hedges will cut off headlight glare, but they will also cut off view of the opposing roadway and the scenery beyond it. Plantings will be attractive in summer, but less so in winter. The monotonous "tunnel" effect of continuous plantings may affect driver behavior.

"Crash- Barrier Tests on Multiflora Rose Hedges." By Russell R. Skelton, Professor of Civil Engineering, University of New Hampshire. *Public Roads*, December, 1957.

Concrete Pavement Without Forms

Paving without forms can be accomplished by the use of a slip-form paver. The slip-form paver is a self-propelled unit which spreads, compacts by vibration, tamps, shapes and finishes the plastic concrete all in one pass. Width of the paver can be adjusted easily to lay a slab from 20 to 25 ft. wide. Concrete is dumped on the prepared subgrade ahead of the paver, between leading wing walls which prevent the fresh concrete from spilling over on the road shoulder and "feed" the material into the front of the paver. Extending clear across the width of the roadway, the 42-in. extrusion plate is the key element of the paver. Leading edge of the plate is somewhat higher than the following edge. As the paver moves forward, the concrete is forced beneath the plate by the weight of the entire unit. The concrete is compacted and becomes a stable mass which will stand vertically, provided it is not disturbed. Finished pavements are now being laid in Iowa and Colorado by slip-form pavers.

"Concrete Pavement Without Forms." *Modern Highways*, December 15, 1957.

Engineering Man-Hours Saved With Electronic Computer

Applications of the electronic computer in the Texas Highway Dept. in solving traverses and extending bid proposals is steadily increasing. In computing bids an average of 50 man-days previously was required to perform the calculations; now with the computer the same calculations are performed by 5 non-engineering people for a total of 5 man-days. Other problems solved by the computer are on earthwork and bridges. To compute the necessary bridge geometry such as beam lengths, beam spacings, bearing seat elevations, etc., with a desk calculator may require from three weeks to six months. The identical calculations are performed in a minimum of 1 minute to a maximum of 20 minutes time on the computer. Improving the quality of a design by trial and error using hand methods is usually prohibitive, but several trials may be made by the computer in very little time. For a quantitative analysis of cost, consider the monthly rate of such a computer installation to be $10,000. This includes equipment rental, salaries, utilities, etc. At a rate of 20 working days per month and a computer efficiency figure of 100 (one hour computer time is equivalent to 100 hours on a desk calculator), the total number of hours amounts to 16,000. If we assume an engineer's salary to be $3 an hour, then the 16,000 hours is worth $48,000. Therefore just to pay for itself, the computer need only be used 20 percent of the time.

"Engineering Man-Hours Saved With Electronic Computer." By John F. Mannix, Senior Program Engineer, Texas Highway Dept. PUBLIC WORKS, January, 1958.

Soils Classification, Exploration and Testing

The pedological soil map as made by the Michigan Highway Department serves two functions: 1) Furnishes direct information to the Road and Bridge Design Divisions;

● **STRIPPING old blacktop on County Road No. 5 near Roseland, Kandiyohi County, Minnesota, this International Drott TD-9 4-in-one unit breaks up 2400 ft. per hour.**

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Get first-hand proof that roads stabilized with Morton Salt last longer, cost less to maintain.

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Saf-Pla is the new rubberized playground surfacing material that greatly reduces injuries from falling on hard, abrasive or unsurfaced playgrounds. According to statements made recently by playground directors, where Saf-Pla was installed, there has been a noticeable decrease in bruises, abrasions and cuts from children falling, and in some cases there have been no accident reports at all. No miraculous results are claimed, but, for all normal purposes, where children are running and playing it has been proved that painful accidents will be reduced or eliminated. Saf-Pla can be applied to black top, concrete or properly surfaced areas.

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and 2) indicates those locations where additional "point investigations" are required. Aerial photographs, the Michigan surface geology map, and the U. S. Dept. of Agriculture county soil maps help to provide information for making a soil map. Special or point investigations include peat and rock soundings, embankment and structure foundation borings, water table soundings, borrow pit investigations, earth resistivity surveys and samplings of soils for laboratory tests to determine specific physical properties. In swamp and alluvial areas, peat soundings are taken on cross sections at longer intervals (100 ft. maximum) than in the swamps having deep pockets and a wide variation in material. Types of rock soundings are divided into (1) preliminary soundings and (2) soundings to determine the profile and cross section of the bedrock surface. Foundation borings are made for all bridges and culverts larger than 40-in. circular or its equivalent. Borrow pit surveys consist of a series of parallel rho (resistivity) traverses which cover the area. A rho traverse is composed of a line of resistivity soundings which is plotted as a cross-section from profile-contours. Earth resistivity is a geophysical method of subsurface exploration based on the fact that different kinds of soil and rock exhibit different values of average apparent electrical resistivity. The Wenner configuration is used, in which 4 electrodes are driven in the ground along a straight line and equidistant from each other. A known alternating electrical current is induced into the ground through the outside electrodes and the potential fall across the inner electrodes is measured.

"Soils Classification, Exploration and Testing." By Michigan Highway Dept., Office of Testing and Research. PUBLIC WORKS, January, 1958.

Design of Asphalt Paving Mixtures

Traffic, weather and climate impose various types of physical stresses upon a bituminous pavement. These stresses may combine or offset each other depending upon conditions. A well graded, comparatively dense asphaltic mix with the proper quantity of binder can usually meet all of the physical stresses. General formulas for mixes that cover a relatively wide range of aggregate gradation which must be adjusted for local traffic conditions include the following: Hot mix asphaltic concrete; hot mix stone filled sheet asphalt surface; hot mix

sheet asphalt surface; and hot mix sand asphalt. Also formulas for plant mix cold laid, road mix asphaltic concrete and dense graded road mix are included. Several tests that are used to verify or adjust the design to assure that the mixes possess the desired characteristics needed for the purpose to which they are to be applied are the Hubbard-Field Stability, Marshall Stability, Hveem Stability and Cohesiometer and the Triaxial Test.

"Design of Asphalt Paving Mixtures." By Ladis H. Csanyi, Professor in Charge, Bituminous Research Laboratory, Iowa State College. PUBLIC WORKS, January, 1958.

County Is Trying Centralized Management

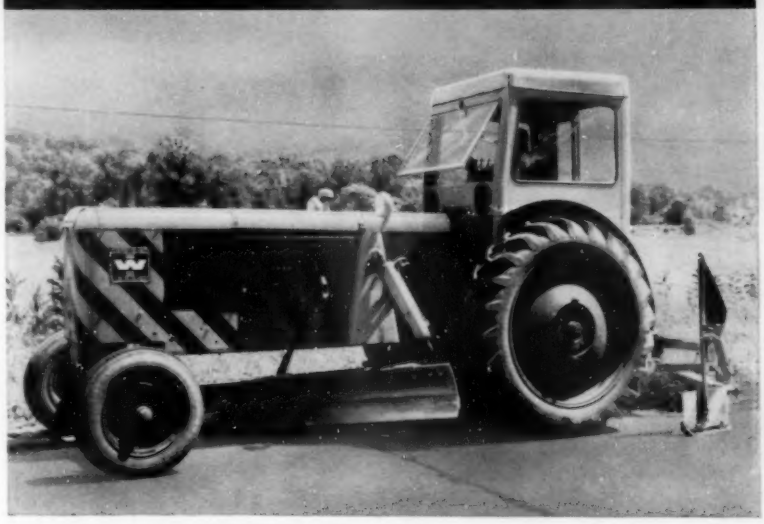
The budget of Mason County, Wash., allows for the employment of less than 40 men, so it is imperative that the best possible plan for deployment and use of men and equipment be devised and employed. Washington state law provides that the county commissioners shall employ a registered engineer who shall be responsible for maintaining and constructing all county roads. In centralized management all phases of road operation are under the county engineer with unlimited authority to use men and equipment as the need dictates and as their skills and abilities are applicable to the specific problem. Because of the many administrative duties of the engineer, he can not give the full time that is necessary to each of the many projects of work, so a general superintendent to work directly under the engineer is appointed. Some advantages of centralized management include: Uniform maintenance of all roads in the county; the commissioners are free to expend their energies on overall county management of other departments or agencies; construction funds can be used where the need arises without specific regard to district boundaries; and by unlimited mobility of equipment, uneconomical duplication can be eliminated.

"Mason County Is Trying Centralized Management." By Frank R. Porter, Mason County Engineer, Washington. *Better Roads*, December, 1957.

Field Sampling of Concrete

Samples of both coarse and fine aggregates from the proposed source of supply are required to be taken at least 7 days before the material

HUBER-WARCO
maintainer



handles 9 maintenance jobs

The Huber-Warco M-52 MAINTAINER pictured above is performing two vital functions. The blade is cutting the berm, while the berm leveler attachment does the leveling job. With hydraulically controlled attachments, this 45½ h.p. torque converter machine will perform service as a bulldozer, lift-loader, berm leveler, side dozer, broom, highway mower, snow plow or patch roller. The versatility of the Huber-Warco M-52 MAINTAINER makes it ideal for a variety of maintenance jobs. See your Huber-Warco distributor for complete details.

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is to be used in concrete in the Ohio Highway Dept. A composite sample representing each 1500 cu. yds. of coarse aggregate or 500 cu. yds. of sand is taken. A sample can of cement is taken for each car or 500 barrels of cement used. Concrete Control Inspectors are specifically trained, both by instruction and experience, for concrete design and control, sieve analysis of aggregate and sampling and testing of concrete. The various tests taken of concrete include the slump test, yield test, percentage of entrained air and determination of aggregate correction factor. Two test cylinders 6 ins. in diameter and 12 ins. high for the compressive strengths are made from each 2000 sq. yds. of pavement or base or fraction thereof placed each day. Also, two test cylinders are made from each 100 cu. yds. of each class of concrete placed each day on structures over 20-ft. span and for structures of 20-ft. span or less the cylinders represent 50 cu. yds. of each class of concrete. Two or three 6-in. x 6-in. x 40-in. concrete beams, using the same concrete as placed in the pavement or base, are made for each 2000 sq. yds. of concrete poured. Beams made to determine when falsework shall be removed shall be tested as required by the Engineer. Two types of beam testing machines are used: Cantilever (two beams required) and centerloading (three beams required).

"Field Sampling of Concrete." By H. R. Craig, Engineer of Construction, Harold Krauser, Field Engineer of Construction, Joseph Unger, Division 8 Testing Engineer, Ohio Highway Dept. PUBLIC WORKS, January, 1958.

Other Articles

"St. Louis Park Establishes **Uniform Street Construction Practices.**" Street improvement was initiated on petition basis and street standards were adopted. By Tom Chenoweth, City Manager, St. Louis Park, Minn. The American City, December, 1957.

"Designing Bases For Roads and Streets." The designing of bases, while only a part of the pavement structure, is often the most important part. By F. N. Hveem, Materials & Research Engineer, California Div. of Highways. Public Works, January, 1958.

"The Use of **Asphalt Emulsion For Stabilization.**" Emulsified asphalt is used for stabilization on secondary roads. By A. L. McMillion, Chief Maintenance Engineer, West Virginia State Road Commission. Public Works, January, 1958.

"Basic Requirements For The Roads of Great Britain." Discussed are the importance of road transport to the national economy, the adequacy of our present road system, and also the effect of increased traffic on accident frequency. By W. H. Glanville, D. Sc., Ph.D., M.I.C.E., and R. J. Smeed, Ph.D., Assoc. I.G.E. Contractors Record and Municipal Engineering, November 20.

"We Relocated a River and Shot Away a Mountain, To Grade a 4-Lane Highway." Unique strategy provided ample rock borrow for this job and permitted economic channel change during period of relatively low water. By Pat Thomson, County Engineer, Douglas County, Waterville, Wash. Roads and Streets, December, 1957.

"Aluminum's Growing Role." How this light-weight, labor-saving and weather resistant metal is serving in highway design. By Duane L. Cronk. Roads and Streets, December, 1957.

"Development of **Modern Traffic Signs."** By Colonel T. U. Wilson, C.B.E., T.D., M.I.C.E., M.I.Mun.E., County Surveyor, Lanarkshire. Roads and Road Construction, November, 1957

"These Surfaces Adapt Themselves to **Road Base Movement,"** By A. W. Jarman, B.Sc., A.R.I.C., F.INST.PET., A. E. Lawrence, B.Sc., A.R.I.C. and R. Slater, M.Sc., A.M.I.C.E. Municipal Engineering, December 6, 1957.

"Pavement Striping Benefits and Practices." By Robert A. Burch, Traffic Engineer, North Carolina State Highway and Public Works Commission. Public Works, January, 1958.

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"EZ-ON" Faces, slip on right over present signs. Your signs are never out of service. Standard regulatory and warning copy—in red and white, yellow and black. They meet every need at ½ the ordinary cost!

2 SIZES—2 SHAPES—REFLECTORIZED

"EZ-ON" Faces are made in 24 and 30 in. sizes, octagon and diamond, of light gauge steel, flanged to easily clamp over old signs. Fully reflectorized, they serve night and day meeting all specifications for durability, brilliance and reflective qualities.

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Yes, 2 signs for only $5.00 . . . a special offer. A trial will convince that "EZ-ON" Faces are the answer to traffic sign costs and maintenance.

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. . . featuring convenience, comfort, quality! A cosmopolitan atmosphere in home-like setting. In the center of all downtown activities. Newly decorated. Ultra modern, comfortable guest rooms . . . excellent food at moderate prices in our modern coffee shop and cafeteria.

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FACING GRAND CIRCUS PARK
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Harry E. Paulsen
General Manager

Snow and Ice Control With Salt

INCREASED winter driving in the nation's ice and snow belt, combined with the national drive for highway safety, have pushed the volume of salt to be used in snow and ice control to a record figure of approximately 2,000,000 tons for the 1957-58 season.

During the past five years an increasing number of highway departments have adopted the bare pavement method, according to the Salt Institute. This type of winter maintenance calls for spreading salt when the first snowflakes fall, followed by alternate plowing and spreading of more salt to keep roads and streets free of ice and snow.

The Engineering Society of Detroit, which made a three-year study of the use of salt for de-icing streets in that city, reported that "many of the economic advantages of a dry pavement over a slippery pavement are intangible. Obviously, it is of prime importance that the people have roads that permit easy access and movement to policemen, firemen, doctors, and ambulances, but how much money is saved by having streets always open for such emergency services cannot be estimated."

The Engineering Society estimated that economic losses to the Detroit business community would rise to $88,000,000 yearly if the city did not have an efficient control program. This overall figure includes an estimated loss of $55,000,000 if storms delayed the working population 30 minutes daily during the city's average of 35 storms per winter; a loss of $25,000,000 to retailers whose sales drop about 50 percent when shoppers find it difficult to get to and from stores, and a loss of $7,000,000 per year for trucking companies who supply the city with materials for factories and food and merchandise for the stores, and then carry away the products of the city's factories.

Comparing the $88,000,000 loss which would accrue without an ice control program, and the $875,000 cost of Detroit's 1954 snow-removal and ice control program, the Engineering Society pointed out that "this is a small sum when compared with the economic benefits to the community."

A similar study on the use of salt for snow and ice control in New York City has been made by C. A. Rogus, Director of Engineering of the Department of Sanitation. In an article in the November, 1957 issue of PUBLIC WORKS, this study was fully covered.

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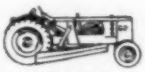
balanced weight and power

The Huber-Warco 6-D & 7-D MOTOR GRADER series has been designed with the right blend of weight and power to handle tough grading quickly and efficiently. A combination of torque converter, tail-shaft governor and power-shift transmission assures constant power at the blade for a greater work volume. Horsepower range of the Huber-Warco 6-D & 7-D MOTOR GRADERS is 100 to 150 h.p. Your Huber-Warco distributor would like to show you the many other features of these modern graders. Contact him today.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Drainage Facilities for Airfield Runway Extension

● PLACING a section of Smooth-Flo pipe. Note saddle branch connections with Hel-Cor pipe stubs for lateral connections and lifting lugs for easy pipe handling.

GEORGE A. BROWN
Resident Engineer,
Louisville and Jefferson County
Air Board

THE Louisville and Jefferson County Air Board administers Standiford Field, Louisville, Kentucky. To provide facilities for present and future plane requirements, runways and taxi strips have been extended, and this necessitated subdrainage and a new storm sewer system. Shallow pipe cover and heavy wheel loads were complications.

For the new storm sewers 2092 feet of 42-inch diameter, 12-gage Smooth-Flo sewer pipe and 246 feet of 66-inch 10-gage were installed under the runways. Next to the edge of the runway were 845 feet of 72-inch 8-gage pipe. In addition, the contractors laid 763 feet of 15-inch asphalt coated corrugated metal pipe; 180 feet of 18-inch; 240 feet of 10-inch; 10,244 feet of 6-inch Hel-Cor perforated pipe; and 3,582 feet of 6-inch Hel-Cor non-perforated pipe.

Design Basis

The storm sewers were designed with a value of n=0.013 in the Manning formula. The pipe was installed with cover depths of 2 feet to 8 feet. Bank-run sand and gravel were used for the underdrain line backfill material. The 42-inch line was installed by a crew of six men and the equipment operators at a rate of 150 to 200 feet of pipe per day. A 1¼-yard backhoe was used for trenching and a motor crane for placing the pipe.

The project was designed by the Army Corps of Engineers at Louisville and completed in 1956. Ruby Construction Company was the contractor.

PLANNING A WATER SUPPLY FOR THE PASSAIC VALLEY

FACED with a shortage of water in the near future, the Passaic Valley Water Commission, which serves the New Jersey cities of Paterson, Passaic and Clifton, has issued a "Statement to Its 45,000 Customers." This points out that the water supply situation is approaching a critical stage. The principal source of water supply is the Passaic River at Little Falls. So long as there is sufficient flow in the river to supply the needs and so long as there is surplus water flowing past the Little Falls Plant to the sea, there will be no occasion (barring other contingencies) to restrict the use of water.

However, the Passaic River is not infallible. Past records show that the flow is greatly reduced during periods of severe drought. Such a condition could recur at any time. Since, at present, there is no reservoir to store Passaic River water, and since the supply is entirely dependent on the natural flow of water, serious drouth would necessitate rationing water and enforcing the curtailment of its use.

In order to meet the current demand for water it is necessary for the Commission to divert 60 million gallons per day from the river. The total flow in the river in the early summer of 1957 was not much more than this. The statement, issued in June of this year, pointed out that forecasts for the summer of 1957 were for subnormal rainfalls.

The Commission is presently serving the cities of Paterson, Passaic, Clifton and surrounding communities and industrial plants located outside the three cities. The total population served is estimated at 400,000. The consumption of water has increased from 35 million gallons per day in 1939 to 75 million gallons per day in current years. The dependable yield is estimated at 76 mgd, of which 35 mgd can come from the Passaic and 41 mgd from the Wanaque reservoir.

The demand for water is increasing in the area served by the Commission. Engineers have estimated the future water requirements, these forecasts being based on studies of population growth, higher standards of living, industrial activity and allied factors. It is estimated that by 1980 the Commission will need 97 million gallons of water a day to meet the requirements of the territory served.

After considering the two possible courses of action (curtailment or expansion), the Commission has recommended that the Point View Reservoir Project (Pancake Hollow) be undertaken to provide an additional water supply to meet the present and future needs of the water system now being operated. Several other possible water supply projects were considered, but this project was finally chosen for the following reasons:

1. The future development of the Passaic River, by means of Point View Reservoir and filter plant additions, is by far the least expensive means of securing an additional water supply. For approximately $12,000,000, 40 mgd more water can be obtained. The cost of this from other sources would be in the neighborhood of $40,000,000.

2. The Passaic River is a good source of potable water, is immediately adjacent to the present water works and can provide an ample supply. All that is needed is a reservoir in which to store water which would otherwise run to the sea and be lost.

The Point View Reservoir project consists of the following: Acquisition of approximately 530 acres of reservoir land at Point View in Wayne Township (a natural reservoir site known as Pancake Hollow); the construction of a dam and reservoir holding 2.7 billion gallons, the construction of a pipe line from the reservoir to Little Falls; the enlargement and renovation of the existing purification plant at Little Falls; and the installation of additional pumps and facilities.

In operation, water would be pumped from the Passaic River at Little Falls during times of high flow and the reservoir filled and kept full in that manner. Water would be drawn by gravity from the reservoir to the Purification Plant at Little Falls during times of low river flow as and when needed.

The construction of these works would increase the dependable supply of water from the Passaic River from 35 million gallons per day to 75 million gallons per day, bringing the total dependable water supply (including Wanaque) to 116 million gallons per day, sufficient to take care of probable needs beyond the year 1980.

If the Project is authorized by the cities involved and is subsequently approved by the State Water Policy and Supply Council, bonds would be issued to pay for the acquisition of reservoir lands and for the construction work as it progresses. The bonds would become the obligation of the Passaic Valley Water Commission and the interest and amortization on the bonds would be paid by the Commission out of water revenues. No part of this expense is permitted by law to be put in the tax rates of the cities served.

In order to meet the interest and amortization on the bonds needed to build the project, the Commission would have to increase the water rates, perhaps 10 percent which would mean about $2.50 or $3.00 per year per household. Since present water rates are lower than those in surrounding communities, and particularly low for large industrial users, the increased cost to finance this needed additional water supply project is not considered unreasonable in consideration of the benefits which will accrue.

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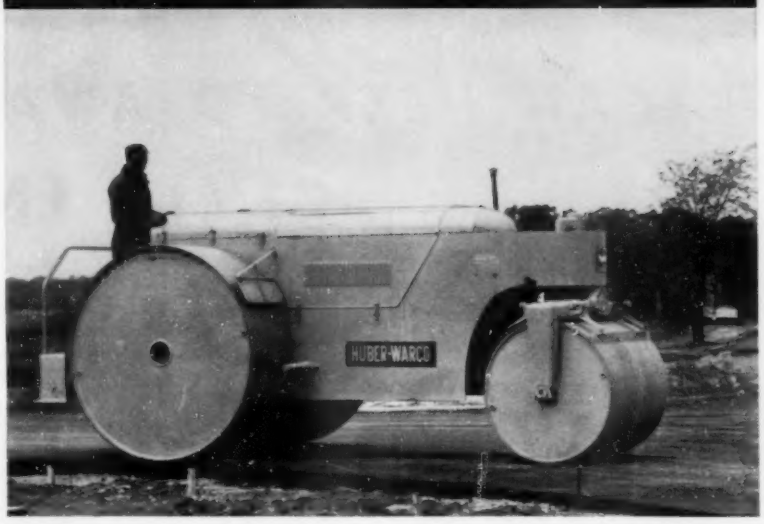
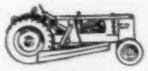


built for a rugged long life

Let's talk features—features that make the Huber-Warco 3-WHEEL ROLLER a durable, efficient machine. Rugged construction . . . torque converter . . . tail-shaft governor . . . 2-speed transmission . . . three-point "live" suspension to cushion shocks . . . anti-friction bearings throughout . . . completely adjustable guide roll assembly . . . dual braking systems are important features that mean efficiency and economy of operation. Huber-Warco 3-WHEEL ROLLERS are gasoline or diesel powered, and are available in standard and variable weight models. Your Huber-Warco distributor can give you the complete details . . . contact him today.

TANDEM ROLLERS

3-WHEEL ROLLERS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HUBER W WARCO

CIVIL DEFENSE CAN HELP TO AWAKEN CIVIC INTEREST

EDDY S. BRANDT,
Civil Defense Director,
Evanston, Illinois

THE HARDEST TASK for a municipality is to get its citizens to take an interest in the improvement of their city. Civil Defense offers a way that should prove helpful not only to Civil Defense but to the entire city government as well.

In Evanston, Illinois, as in most cities, interest in public affairs comes to life only at election time and sometimes not then. However, when families realize that natural disasters and war are really an immediate danger, they are more willing to assume the job of protection. They regard Civil Defense as a sort of insurance when they learn that, during last year, there were 362 disasters in the 2½-county area surrounding the city of Chicago alone, according to American Red Cross figures.

There are so many branches of Civil Defense that it now offers a wide scope of opportunities for helping. Besides the regular divisions, such as fire auxiliary, police auxiliary, wardens, and so forth, there are many specialized services.

For instance, we have secured the volunteered services of the retired head of the physics department at Northwestern University to give classes in radiological fallout. A number of citizens, both men and women, have attended these classes with growing regularity.

The three hospitals are united in Civil Defense under a doctor who has served as head of an Army Medical unit. Added to assistance in practice drills and even to the donation of necessary equipment for disaster is a government Emergency Hospital to be placed underground, Northwestern University contributing the space under its campus. In a recent test of our medical corps, 41 out of 43 volunteers responded to a call during a deluge and near-tornado.

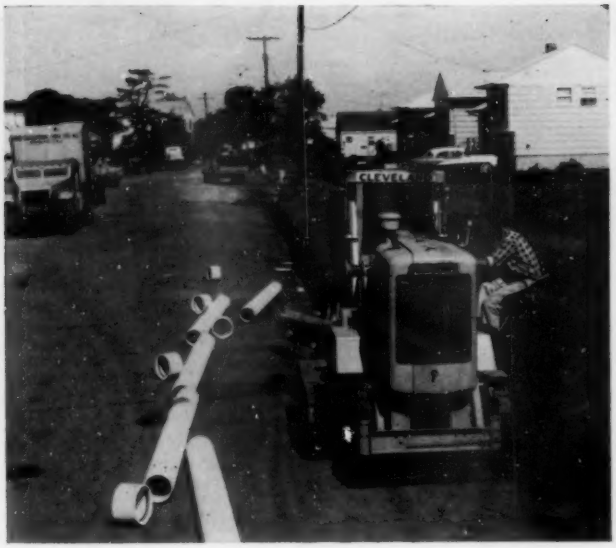
It is much easier to place volunteers at work in Civil Defense than it would be in connection with the functions of a city government. A druggist calls our headquarters and asks if he can help. We immediately make him chairman of a drug store committee to work out the part druggists must play in a bombing or a natural disaster. Every drug store would become a miniature and temporary hospital.

The manager of a leading hotel asked what he could do. We appointed him chairman of a hotel committee to work out plans for the

● **FIRST CLASS in Radiological Protection ends with about 20 Evanston citizens receiving certificates. At left front is Mayor John Kimbark, behind him are two of the instructors.**

● **CIVIL DEFENSE officials manning headquarters during Operation Alert 1957. Shown are Zone Warden Henning Salene, Director Eddy S. Brant and Tom L. Davidson, Asst. Director.**

Trench digging with Cleveland cuts repaving costs 25%



ERN CONSTRUCTION CO's new Cleveland 110 Trencher cut repaving costs 25% on the installation of 11,000 feet of 12 and 8 inch pipe throughout East Brunswick Township near Springfield, New Jersey. Trench was 5½ feet deep and 24 inches wide. Foreman Henry Appleby says:

> **"We're able to reduce repaving costs 25% with the Cleveland because it cuts cleaner, narrower trench than the backhoe method we used previously."**

"We get better production, too," says Appleby. "The Cleveland digs about 780 feet of trench per hour compared to about 100 to 150 feet with the backhoe."

Good Everywhere ®

The CLEVELAND TRENCHER Co.

20100 St. Clair Avenue • Cleveland 17, Ohio

● WARDENS dash to report to posts during Operation Alert 1957. Tornado-like weather failed to dampen their enthusiasm.

● CIVIL defense fire corps learns to handle equipment on the Evanston CD heavy rescue trailer, to aid regular forces.

hotel occupants and the people living near the hotels as well.

After a Civil Defense speaker had finished one of his talks emphasizing the needs, a manufacturer came up to the speaker and offered to help in the industrial field. He was appointed to head up a much-needed movement among the plants located in or near the city. Drills, stock-piling of essential items, microfilming of formulas and records, were outlined as projects to the industries of the city. Firms are being encouraged to join together in building underground shelters so that the cost can be divided.

One building supply company owner was asked to head up the Utility and Engineering division. He contributed his equipment and workers to build an air field to be used exclusively for bringing in medical and emergency supplies. This is the first Civil Defense air field in the country.

Support by Local Groups

The Junior League of Evanston has been interested enough to take a census of public places such as schools and churches, or restaurants, where mass feeding could be conducted and homeless families could be sheltered temporarily.

Recruiting is being planned to secure organized cooperation in case of war or disaster among the women, the churches, the PTA and even the children above a certain age.

Most young men of high school senior age are interested in scientific apparatus. Consequently we found it easy to organize a two-way radio corps and equip it with the necessary radios so that the members could practice and be ready for an emergency. They have helped us in many public affairs.

Don't think we take everybody that volunteers and make each one the head of a committee, however. We have a way to sift them. Merely ask them to outline their project in writing. Few come back after that, but those who do we find are well worth the time it takes for us to work out the plans with them.

"It takes all kinds of people to make a world" is a trite but true saying. That is why there are so many organizations in a city. And that is just the reason why Civil Defense can be divided into so many working sections.

Each group can be and should be small. Yet the combination of groups in our city of 78,000 will total about 1,000. A live, working thousand can be quickly called to action and lead the rest of the city to smaller losses in injury and life. Already we have tried a test of a quarter of this group during a near-disaster and 153 responded in less than 35 minutes.

At a recent large fire, the Civil Defense fire corps was called in to help. A recent rush job of laying a new water line was running into darkness, so the flood lights and generator of the Civil Defense rescue truck were called to help.

Furthermore, as we said at the beginning of this article, the civic life of our city is being strengthened by this new group of a thousand volunteers.

Complaints Are Service Requests For City Employees

The city employees of Covina, California, are impressed with the slogan, "Service Is Our Most Important Product" as the underlying reason for being associated with local government. This bit of advice, detailed with a code of behavior toward the "Citizen" is given to each new employee.

Treatment of the citizens and their complaints, which Covina City Administrator chooses to term "service requests," is reported by each employee who is on the receiving end of such a contact. Forms are provided which give the details of the request, the action taken, and the results achieved. The report constitutes a work order to the department responsible for the matter in question, and contributes to a record of the volume and intensity of requests for services not currently authorized in the municipal program. Analysis of the requests received for services both within and outside of the scope of scheduled municipal functions provides a means of evaluating the capacity of a department under its current budget.

New city employees are also furnished with an attractive and carefully prepared bulletin designed to answer questions on retirement, leave, promotions and similar city employment policies.

• • •

Water Plant Serves City and County

Canon City, Colo., held an open house last fall at the recently completed water filtration plant which will serve not only Canon City but much of Fremont County with water.

Now is the time for soil-cement...

Spring break-ups make driving hazardous on roads like this.

On the job the year around. A Louisiana soil-cement road.

75% of your materials are free

with soil-cement, the 20-year-plus pavement

You save money right from the word go. You work with what you've got —soil and rubble in the old road.

Any gravel or blacktop left on the old road? Mix it with portland cement and whatever soil is at hand . . . give it a thin bituminous topping.

Modern soil-cement can be made with practically any kind of soil—or the broken-up surface of the old road. It gives you *lasting* precision-built roads instead of upkeep headaches. And the job can be done in most cases with equipment already on hand . . . and fast, new machines are now available.

You get a pavement that will last 20 years and more! For soil-cement grows stronger year by year. Core tests prove it. *It's stronger inch for inch than any other paving material short of concrete.* Loading tests have shown it can carry twice the load of crushed limestone base . . . three times that of gravelly clay.

And soil-cement has beam strength . . . spreads the load over wide areas of the subgrade. No potholes, no washboarding, no raveled edges. That's why engineers are converting more mileage to low-cost soil-cement every year. *Write for booklet, "Soil-Cement Pavement."*

It's the lowest-cost precision-built pavement for:

ROADS • STREETS

SHOULDERS • SUBBASES

AIRPORTS • PARKING LOTS

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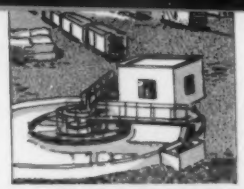


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

Flexible Treatment For Mixed Wastes

The industrial wastes received at the South San Francisco-San Bruno sewage treatment plant comprise about half of a daily flow of 6 mgd. The wastes are from three meat processing plants, a packing house, a tannery, a steel pickling plant, and a shop towel laundry service. With completely duplicate facilities available, the sewage treatment plant can process the industrial wastes separately or with domestic sewage. Separate influent channels are equipped with remote recording flow meters and pH meters. The plant units consist of automatic bar screens, grit chambers with mechanical grit removal equipment, flocculation and sedimentation units, and heated sludge digesters. The packing house wastes are pretreated to remove grease and paunch manure. The latter is trucked to the sewage treatment plant and dumped on the sludge drying beds. The average weekday flow is 0.7 mgd, on the basis of which the packing house is charged $25,000 annually. The tannery uses the chrome process and employs pretreatment of its wastes to remove hair and fleshing. Chrome wastes are kept out of the sewer at present. The tannery is charged $4,275 annually for excess solids in the effluent and $2,300 on the basis of volume. The laundry waste is pretreated by sedimentation, but still contains settleable solids and oils when it arrives at the sewage treatment plant. The surcharge for excess solids is $4,378 annually and the charge for the volume of wastes amounts to $3,111. The pickling wastes contain one percent sulfuric acid and 6 to 10 percent ferrous sulfate. Pretreatment involves raising the pH to 5.5 with soda ash. The suspended solids load, mostly ferric hydroxide, is 1,700 lb. per day for which a surcharge of $5,580 annually is made. The charge made to the industry on the basis of volume is $3,449.

"Industrial Wastes Effects at the South San Francisco, California, Sewage Treatment Plant." By H. L. Schweining, Supt. of Sanitation. *Sewage and Industial Wastes*, December 1957.

Stannous Chloride for Decolorizing Dye Wastes

A promising method for removing color from azo-type dyes involves the reduction of the nitrogen bond with stannous chloride. Preliminary tests were made with monoazo, disazo, and trisazo dyes. One hundred milliliter samples were heated at 212°F for a maximum of 2 hours after the addition of varying quantities of stannous chloride. A greater quantity of stannous chloride was required to decolorize disazo dyes than for monoazo dyes and still more for the trisazo dyes. Similarly the time required increased with the number of azo groups in the dye compound. On the basis of further investigations, it is estimated that a small mill dyeing 1000 lbs. of cotton per day with a 50-50 mixture of mono and disazo dyes would pay $2.01 per day to remove color from the wastes. A plant dyeing 10,000 lbs. of cotton goods per day with equal mixtures of all three types of dye would pay $72.80 per day for waste treatment. It appears that treating highly concentrated hot solutions of the waste is the more practical procedure.

"Color Removal from Azo Dye Wastes." By N. L. Nemerow and W. L. Wilson, North Carolina State College. *Industrial and Engineering Chemistry*, December, 1957.

Evaluation of Standard Treatment for Paper Wastes

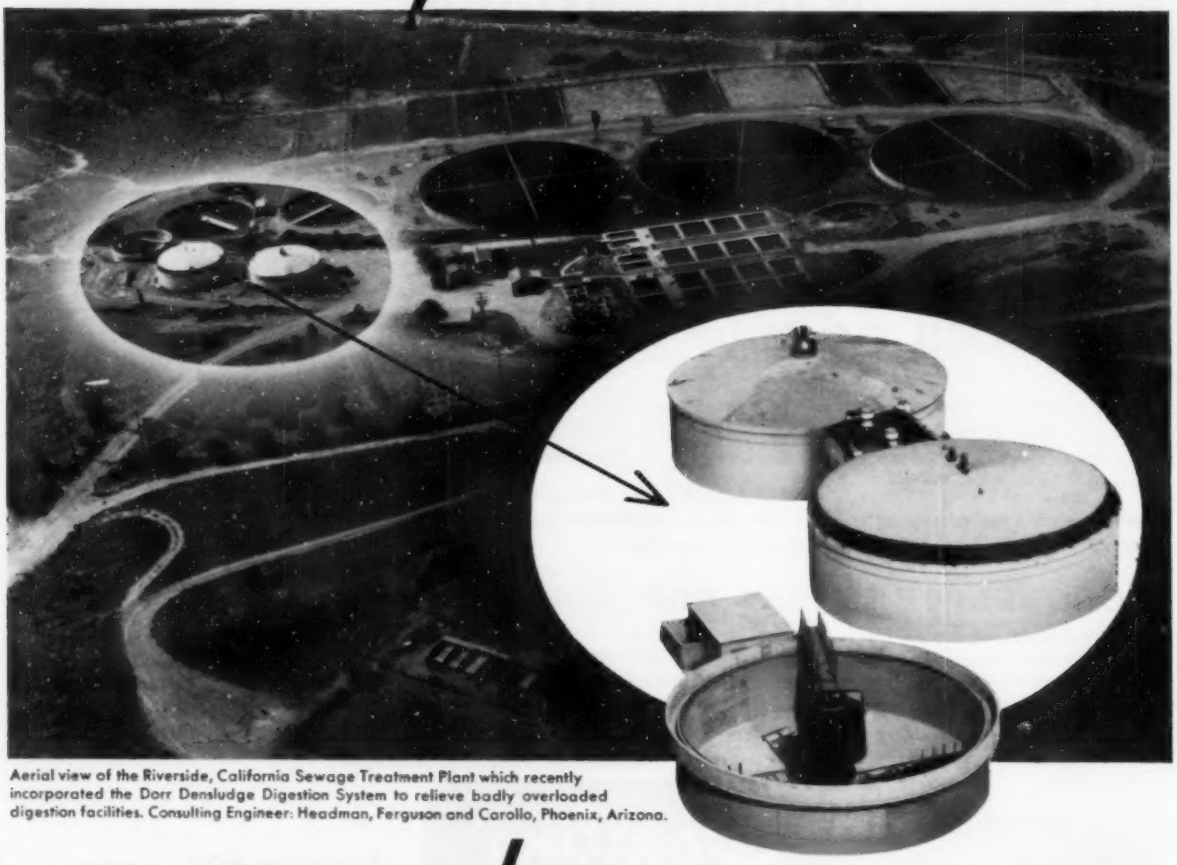
Research and development work of the past 10 years have improved standard sewage treatment techniques and broadened their application to industrial wastes. In some instances this has pointed out the limitations of some methods and,

Water Storage Basins Lined With Bitumen

THE El Centro, Cal., water treatment plant (see PUBLIC WORKS, May, 1957, pages 114-120) has two bituminous lined storage basins each 512 by 652 feet in size, 16 feet deep. Inside slopes are 2:1. These slopes were paved by an unusual method involving a paver-finisher. Using a Blaw-Knox PF-90 bituminous paver-finisher, the job of laying 4-inch thick bituminous surface on the sloping walls of the basins was accomplished at the same rate of production as the easier reservoir bases. The bituminous-coated slopes were rolled with the front wheel assembly from a tandem roller pulled by a cable unit on a tractor on the top bank of the reservoir.

The paver-finisher was stripped to allow use of the screed arms, screed and tamper assembly only, and a separate engine was installed to drive the tamper. The screed assembly was pulled up the slope by a winch installed at the top of the reservoir. Bituminous paving material was dumped in front of the paver-finisher with a clamshell bucket operating from a truck crane. The contractors were Basich Bros., San Gabriel.

IT'S NEW / It's from DORR-OLIVER



Aerial view of the Riverside, California Sewage Treatment Plant which recently incorporated the Dorr Densludge Digestion System to relieve badly overloaded digestion facilities. Consulting Engineer: Headman, Ferguson and Carollo, Phoenix, Arizona.

The Dorrco DENSLUDGE DIGESTION SYSTEM

The new Dorrco Densludge Digestion System, already proven in full-scale treatment plants, is a new method of digesting sewage sludge that makes possible a reduction of up to 80% in digester capacity requirements compared with conventional systems. The basic operation of the Densludge Digestion System involves concentrating sludge ahead of digestion in a specially designed thickener, then digesting sludge in a Digester equipped with high-capacity draft tube mixers.

By removing the excess water in the raw sludge the Densludge Thickener reduces by one half, or more, the volume of raw sludge to the Digester. In the Digester, high capacity draft tube mixers insure full capacity utilization by maintaining homogeneous conditions throughout the tank. These reductions in sludge volume can now be directly translated into reductions in overall digester capacity requirements.

For more complete information on The Dorrco Densludge Digestion System, write for a copy of Bulletin No. 6262, Dorr-Oliver Incorporated, Barry Place, Stamford, Conn.

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on small congested watersheds, that treatment alone will not suffice. In the case of sedimentation, techniques for handling difficult clarification and thickening problems in the pulp and paper industry have been sought. Flotation and direct filtration methods have broadened the scope of clarification to cover a greater number of effluents. The liquid cyclone and super centrifuge are now under study. In activated sludge treatment, while excess sludge disposal remains a serious problem for some wastes, it is encouraging to note that much higher efficiencies in terms of detention requirements have been realized for a number of effluents than are commonly obtained in sewage treatment. These are due to the employment of nutrients and higher temperatures, up to 55°C. Turbo-aeration devices have permitted treatment of wastes with very high BOD values. It appears from results obtained with stabilization ponds that much improvement is possible and that their application will be broadened. The use of kraft pulp mill and papermaking effluents for irrigation has been successfully practiced in arid regions of the country, with both vegetable and fodder crops appearing to thrive without soil damage.

"Modern Approaches to Pulp and Paper Mill Waste Problems." By H. W. Gehm. National Council for Stream Improvement, Inc. *Sewage and Industrial Wastes*, December, 1957.

Experiences with Coke Plant Wastes

The Donner-Hanna Coke Corporation of Buffalo, N. Y., uses 10 mgd of water in the production of blast furnace coke, gas, tar, ammonium sulfate, benzol and related compounds. Since construction of the plant in 1919, various methods have been applied for handling disposal of wastes to the Buffalo River, including the use of injection wells to salt water strata during a particularly critical period when no phenols could reach the river. After stream classification by the New York State Water Pollution Control Board became effective in 1954, the Corporation agreed to a pollution abatement program which included a thorough study of in-plant processes to prevent escape of the more objectionable wastes without treatment, cooperation with other industries in bioassays and similar toxic waste investigations, and provision of the most practicable method for reduction of phenolic wastes. Prior

How to select the right flow-measuring device

Selecting the correct device is simply a matter of choosing the one that best meets your requirements. The wide variety of Simplex Primary Elements makes this selection easy.

This table shows you which of Simplex's standard elements performs best under various flow conditions. (Not shown are Simplex primary devices of steel or concrete, designed to meet the physical limitations on special jobs.)

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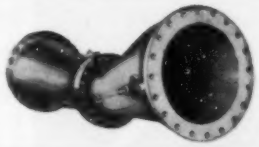
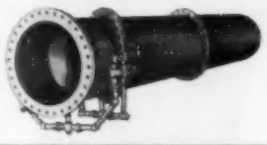
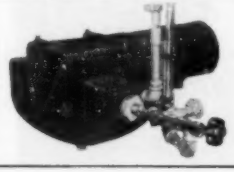
FLOW CONDITION		SOLUTION
NORMAL WATER, AIR OR GAS FLOWS		TYPE VT—STANDARD VENTURI TUBES Cast iron with bronze bushed main piezometer holes and bronze throat liner. Flanged, bell or spigot ends. Inspection opening at throat. Special metals for high pressures or caustic liquors, corrosive gases, brines, etc. BULLETIN 005
NORMAL WATER, AIR OR GAS FLOWS		TYPE TG—INSERT TUBES AND NOZZLES Withstand high pressures. Fit inside existing lines . . . permitting light construction. This, plus *short length*, cuts costs. BULLETIN 100
SMALL FLOWS OF WATER, GASES CORROSIVE FLUIDS		TYPE TF—MINIATURE VENTURI TUBES Machining to .0005" assures accuracy. Main diameters as low as ½"; throat diameters down to .1". Welded stainless steel models for high pressures. BROCHURE
NORMAL SEWAGE, SLUDGE, TRADE WASTES		TYPE VTJ—SINGLE TAP VENTURI TUBES Single taps at main and throat have bayonet-type valve for fast cleaning. Absence of pressure belts prevents clogging. Inspection opening at throat. BULLETIN 005
NORMAL SEWAGE, SLUDGE, TRADE WASTES		TYPE VS—FOUR TAP VENTURI TUBES Four cleaning valves at main and throat can be operated manually, by air, or hydraulically to keep piezometer holes clear for top accuracy. Two hand holes on each pressure belt and inspection opening at throat. BULLETIN 005
LOW-VELOCITY SEWAGE, HEAVY WASTES		TYPE VE—ELLIPTICAL VENTURI TUBES Developed specifically to accurately measure low-velocity sewage, sludge and heavy trade wastes—under low pressures. *Flat top* prevents air binding. *Flat bottom* is self-scouring. Inspection opening at throat. BROCHURE
LOW-HEAD SEWAGE, SLUDGE, TRADE WASTES		TYPE S—PARABOLIC FLUMES Full 20:1 range for open flows. Accuracy ±2%. Flanged, bell or spigot inlet for 6 to 36" lines. Integral sediment trap, piezometer reamer, gauge glass, direct-reading flow scale. BULLETIN 801

to the agreement, preliminary work had been completed on a benzol extraction type dephenolizing plant, embodying the Koppers-Loe process, and with the approval of the New York State Water Pollution Control Board, a $250,000 plant of this type was built in 1956. The process involves passing the phenol-bearing crude ammonia liquor through contact towers against a countercurrent flow of light oil, bringing about extraction of the phenol by the oil. The oil is later dephenolized with caustic soda to form sodium phenolate, and is recycled. The sodium phenolate solution is recovered to make crude concentrated tar-acids or passed to a concentrator where the excess water and light oil are boiled off.

"Chemical-type Coke Plant Solves Waste Problems by Cooperative Efforts." By Philip S. Savage, Vice-President, Donner-Hanna Coke Corporation. *Sewage and Industrial Wastes,* December, 1957.

Harbor Pollution Avoided By Oxidation Ponds

Faced with the necessity of providing combined sewage and industrial waste disposal with only harbor waters for dilution and the problem of preventing damage to swimming and recreational interests in the area, the Auckland, New Zealand, Metropolitan Drainage Board is constructing primary treatment facilities to be followed by oxidation ponds. Facilities will include screening, preaeration, grit removal, sedimentation, and sludge digestion. The oxidation ponds will cover an area of 1,390 acres and will have a capacity of 5,400 acre-ft. and a detention period of 62 days. Continuous recirculation will be provided. Interceptor construction involves the use of 48-in. diameter mains to 102-in. equivalent diameter reinforced concrete elliptical sections. To resist sulfide corrosion, high strength concrete with pozzolanic materials added is being used.

"Oversized Ponds Oxidize Wastes." *Engineering News-Record,* December 5, 1957.

Other Articles

"**Toxicity Studies** of Metal Finishing Wastes." By W. D. Sheets, Ohio State University. Studies of the effect of chromium and other toxic ions on biological sewage treatment processes are reported. Sewage and Industrial Wastes, December 1957.

"Potentiometric Recorder for **Hydrogen Sulfide and Hydrogen Cyanide.**" By John P. Strange, Mine Safety Appliances Co. Continuous measurement of these poisons in air or gas streams is now possible with an instrument capable of being adjusted to give full-scale deflection for concentrations of 4 ppb to 50 ppm. Analytical Chemistry, December, 1957.

• • •

Air Pollution Meetings Scheduled

The second in a series of programs on air pollution sponsored by the Department of Continuation Education of the Columbia University School of Public Health and Administrative Medicine is to be held in New York City, February 25 and 26. It is to be a continuation of the orientation course held last December for persons having administrative and supervisory responsibilities in fields related to air pollution investigation and control. Application forms or information regarding the course may be obtained from Dr. Mabel S. Ingalls, Program Director, School of Public Health and Administrative Medicine, Columbia University, 600 West 168th St., New York 32, N. Y.

Combustible Rubbish Defined

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Booklets covering the subject of control of microscopic organisms and root and fungus control will be sent upon request.

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FIRE PREVENTION AND FIRE FIGHTING

for the PUBLIC WORKS DEPARTMENT

DONALD E. MAGNESS

ONE OF the primary problems of public works departments the nation over is money. No department ever seems to have quite all the money it needs for equipment and supplies; and yet at inventory time the total value of stock and equipment comes to quite a large amount.

Even though most of the departments are constantly looking for money for new stock and equipment, the large inventory on hand deserves to be protected. Because of the nature of the various types of rolling equipment and stock that a public works department must keep on hand, fire is a constant hazard.

Fire is formed by what is called the fire triangle. One side of the triangle is heat of ignition, another is fuel, and the third is oxygen. When the three combine, fire is the result. Large stocks of paint, tires, wood, grease, oil, gasoline, chemical compounds and many other items form material for the fuel side of the fire triangle. Smoking, matches, welding, heating devices or mechanical sparks give the heat; and oxygen is always present in the atmosphere. Any public works department has enough of all three sides of the fire triangle to warrant close and careful attention.

Practically every department has on hand a satisfactory number of the different types of fire extinguishers. Usually these are hung around the building in spots chosen with great care and then promptly forgotten. These extinguishers are not a substitute for a fire department, but they are, when properly used, a wonderful first aid line of fire defense. This is true not only of extinguishers, but any number of first aid fire fighting appliances such as standpipes with hose, sprinkler systems, fire doors, and many more. Unfortunately, any one of these safeguards can be rendered useless by persons unfamiliar with the proper function of the device. A closed sprinkler system valve or a fire door wedged open can mean the difference between a small fire and a total loss fire.

The employees to whom this equipment is available must know the equipment and its proper use. For example, in the several years that I was in the public works field, it was shown quite forcefully that the men were not familiar with the purpose of the different types of fire extinguishers nor did they have the confidence in them that they deserve. Confidence in fire extinguishers can be developed best by showing the employees just what a properly used extinguisher of the proper type can do to combat fire. On one occasion while I was with public works, one of the tar kettles boiled over and was soon completely involved in flame. The crew promptly called the fire department, which was absolutely correct; but then they did nothing else because they considered the mass of flame too great to fight with an extinguisher. One of the office force, who was familiar with fire extinguishers, happened along at this time. By using a carbon dioxide (CO_2) extinguisher, he had the blaze out completely within thirty seconds.

Local Fire Department

Your local fire department can go a long way to assist you in making your department as fire safe as possible. Any fire department will be glad to set up a training program for your employees to cover such things as the particular hazards in your department, the proper way to turn in a fire alarm and first aid for injuries that often plague a public works department; and also to discuss the different means of fire fighting at your disposal. Even the simplest fire fighting principles are important. Many people learn as children to wrap a person whose clothing is burning in a blanket or jacket; but even this simple action can be fatal if not done properly. The average person is very likely to rush up and quickly wrap the blanket around the victim's body. This may well force the flame up into the victim's face. If the victim should take a breath the flame would very likely be pulled far enough into the lungs to be fatal. The simple act of starting the wrap at the neck would avoid this hazard.

Regular fire drills supervised by fire department personnel would be effective in stimulating interest and also reliability in case of an actual fire. Fire drill, in this sense, does not mean the usual timed building evacuation idea that the term usually brings to mind, although it would be an important part. Many other types of drills could be included such as the laying of hose from building standpipe racks or question drills concerning the proper fire fighting appliance for different types of fires. Another thing that can be made use of in drills is the fact that some types of extinguishers must be emptied and recharged annually. At recharge time some actual fires could be built and the extinguishers emptied by the employees discharging them at the fires.

At the same time the fire fighting training is taking place, some information on the maintenance of the available fire fighting equipment could be given. Many times such equipment is abused because of lack of knowledge. An example of this might be the use of fire hose from a wall cabinet. Perhaps it would be used for drill and then carefully rehung while still damp. The average employee would probably not realize that the water left in the hose will tend to react with the sulfur in the rubber hose lining to produce a weak solution of sulfuric acid. The action of this acid might well render the hose useless in time of an emergency.

Fire Safety Procedures

Drill and maintenance can do an excellent job; but some provision should be made to familiarize every new employee with the fire safety procedures of the department. Many departments give out information booklets to new employees to acquaint them with departmental policy. Perhaps a section of this booklet could be devoted to emergency procedures in case of fire; or possibly a fire department representative could give a class every so often for the new men to explain these procedures.

In order to insure that each new employee would carefully familiarize himself with the procedure, a written test could be given at the end of a specified length of time. If the department has a probationary period, passing this test might well be a requirement for a successfully completed probation. Fire safety is important enough to justify such action.

The great majority of fire departments are more than willing to

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OVER 40 miles of Vitrified Clay Pipe, in all diameters, go into Frankfort, Kentucky's new $2,500,000 sewer and treatment plant program. This extensive project is designed to eliminate the health menace involved in dumping untreated sewage into the Kentucky River and in the use of private disposal systems.

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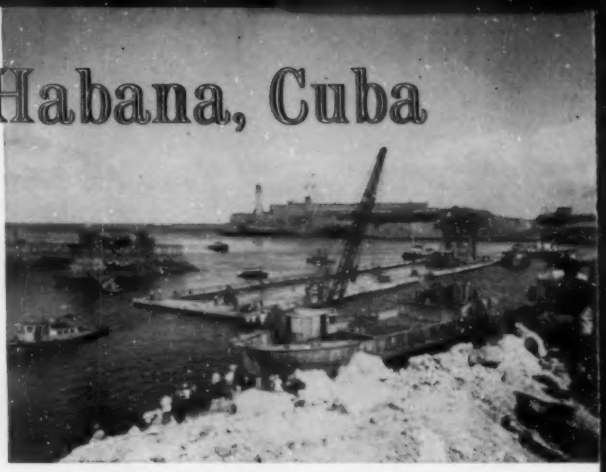
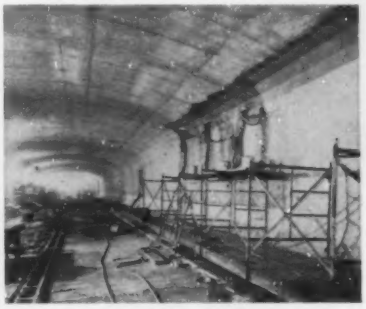


Four-lane, underwater tunnel, connecting Malecon Drive, City of Havana, Cuba with Guanabacoa near the famous Morro Castle, opening the sparsely-populated peninsula to residence and commercial activity.

Mammoth precast concrete sections are floated to location by attached pontoons, lowered 24 meters under water and connected to previously-sunken sections. ***Note the famous Morro Castle. Top, center background.***

Design, engineering and construction by Societe des Grand Travaux de Marseilles, Paris, France, 733 Meters Long, 23 Meters Wide, 7 Meters High, cost $28,500,000.00. Waterproofed inside and outside with THORO System products, THOROSEAL, WATERPLUG and THORITE. Two lanes will be opened by December, 1957.

From Havana side, tunnel entrance grades down to harbor pool level.



Two double-lane tunnel sections take shape; forms will be filled with poststressed concrete.

Precast sections of tunnel, honeycomb patched with THORITE Patching Mortar and entire surface protected with THOROSEAL.

Thoro System Products applied, completes the job!

Preparing interior surface for WATERPLUG and one brush and one trowel coat of THOROSEAL. All walls, floors and ceilings are sealed with THOROSEAL.

THOROSEAL is being applied to all interior surfaces. Over 800 drums of WATERPLUG have already been used, where water was entering and where sections were joined together. All honeycomb and construction faults were sealed with THORITE Patching Mortar, before lowered to position in the bay.

Thousands of drums of THOROSEAL, WATERPLUG and THORITE Patching Mortar are being used on this vast project, which will be completed in February, 1958.

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assist with a comprehensive fire prevention program. They would be willing to aid in writing fire fighting and fire prevention procedures as well as to devise suitable testing material.

It might well be noted here that in many cases when a worthwhile training program has been started, the employees themselves have become interested enough to go on to form regular shop fire brigades.

It is not the purpose of this article to set forth any rules regarding fire fighting. Your local fire department is familiar with your local hazards, problems, and equipment and so is best suited to map a detailed training campaign; but the training is important. Trained men are confident and able. Utilization of a well-run training program will give your men a good account of themselves in time of emergency.

Two things are of great importance: In case of fire, call the fire department first, and then have personnel trained to do first aid fire fighting until the fire department arrives. The taxpayers have a great deal of money tied up in your department and they have the right to expect that it is being protected in the best possible way.

Texas Program Features Instrumentation

The 1958 Texas Water and Sewage Works Short School will include a two-day course on instrumentation and automatic controls and a symposium on computers for water supply problems. The session on instrumentation deals primarily with the maintenance of control equipment and is the first attempt of the Texas organization to give comprehensive instruction on the subject.

The state's water problem and the recent steps toward its solution will be the theme of the opening general session, with participants including Marvin Nichols, Chairman of the newly organized Water Development Board, and Durwood Manford, new Chairman of the Board of Water Engineers. Texas' Governor Price Daniel will highlight the discussion at the annual banquet. An all-day session on disposing of industrial wastes, will be a continuation of the 1957 School's highly successful effort, "Water, Water Everywhere, But . . ." The School will be held March 2 to 7 at College Station, Texas. Further information may be obtained from V. M. Ehlers, Director, Division of Sanitary Engineering, State Department of Health, Austin, Texas.

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NOTICE TO BIDDERS

Sealed bids or proposals, addressed to City of Fort Lauderdale, Florida, and marked Project No. 627 "S.E. Third Avenue Bridge Across New River" will be received at the office of the City Commission of Fort Lauderdale, City Hall, Fort Lauderdale, Florida, until 11:00 A.M., E.S.T., March 7, 1958, and at twelve o'clock noon on said date they will be publicly opened and read aloud.

The project consists of the construction of a double leaf rolling lift bascule span with all its appurtenances, steel and prestressed concrete approach spans, and filled approaches between retaining walls.

Instructions to Bidders, Proposal, Form of Agreement, Form of Construction Bond, Specifications, and the Plans may be examined at the office of the City Engineer, City Hall Annex, City of Fort Lauderdale, Florida, on and after 9:00 A.M., January 7, 1958, or copies of same may be obtained there.

Plans and specifications may also be examined at the offices of J. E. Greiner Company, 1106 N. Charles Street, Baltimore, Maryland and J. E. Greiner Company and Associates, First National Bank Building, Tampa, Florida.

A deposit of $25.00 will be required for each copy of the Contract Documents which deposit will be refunded, to bidders, upon return of the Documents in good condition, within ten days after the opening of bids.

Each proposal must be accompanied by a certified check in the amount of 2% of the total amount of the bid, made payable jointly to the City of Fort Lauderdale, Florida and the bidder, (i.e., City of Fort Lauderdale, Florida or John Smith, Inc.) as assurance that the bid is made in good faith. This check shall be retained by the City as liquidated damages should the bidder refuse or fail to enter into a contract with the City for the execution of the work, in the event the proposal of the bidder is accepted.

Public Liability and Property Damage Insurance and Construction Bond will be required.

The City Commission reserves the right to waive any informalities in or reject any or all bids and to accept the bid most favorable in the interest of the City, after all bids have been examined and canvassed.

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THE BACKGROUND of MUNICIPAL WATER TREATMENT

RALPH PORGES,

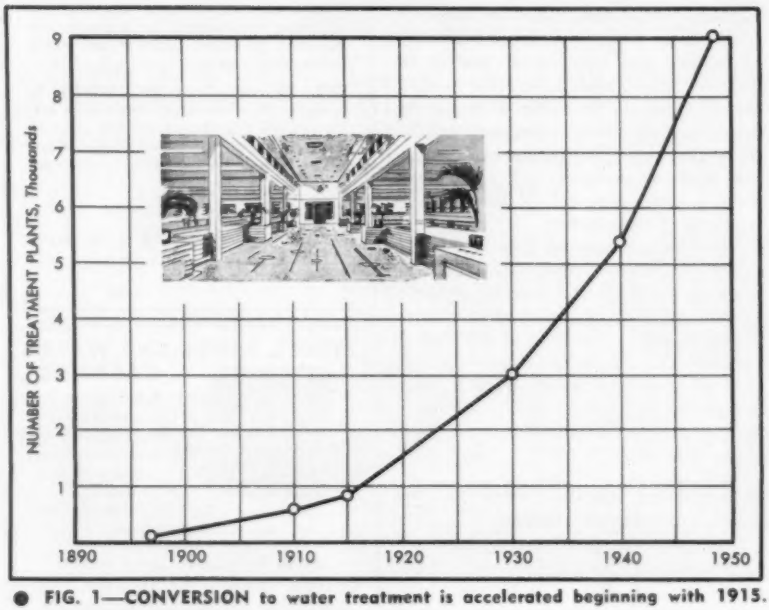
Senior Sanitary Engineer, Water Supply and Water Pollution Program, Cincinnati, Ohio

THE RECORDED history of public water supplies in the United States, although somewhat clouded with time, establishes the existence of a supply in Boston in 1652[1]. The second and third supplies in this country were at Schaefferstown, Pa., in about 1732 and Bethlehem, Pa., in 1761. Moses of the Pennsylvania Department of Health, in a recent presentation on "Early Pennsylvania Water Supplies"[2] states that "The oldest public water works in Pennsylvania and perhaps in the United States, is that of Schaefferstown." The establishment of additional water supplies and the advent of treatment have been well reported both by the excellent Manual of Water Works Practice[1] of the AWWA and the fine treatise "The Quest for Pure Water"[3].

In 1800, 17 water works were in existence. This number was doubled by 1825 and reached 100 by 1850; 25 years later there were 243; and by 1885 there were 1000. A decade later, 1895, the total was 3000. It was apparent that water works installations were endeavoring to keep up with the rapidly expanding urban population. Also, it was during this time, the late 1880's, that water treatment came into use. In 1897 there were about 100 rapid sand and a dozen or so slow sand filter plants.

The Manual of Water Works Practice, 1925[1] states, after the 1895 entry: "Here, complete half-decade records stop, but from the best figures available it is estimated that there were over 9,000 water works in the United States and its possessions at the close of 1924, supplying 10,100 communities". Thus for nearly 30 years during vital advances in water supply practice—the large increase in water supplies and water treatment works, the beginning and widespread use of chlorination, and the subjugation of typhoid fever as a water-borne disease—there is a paucity of records.

Consequently, it was extremely interesting to analyze an unpublished tabulation uncovered in the files of the Robert A. Taft Sanitary Engineering Center, titled as follows:



● **FIG. 1—CONVERSION to water treatment is accelerated beginning with 1915.**

MUNICIPAL PLANTS

Water Treatment in the United States

From data available at Stream Pollution Investigation Office

Cincinnati, Ohio

Compiled by

R. E. Tarbett (now deceased)

Associate Sanitary Engineer

The report, listing individual water works by States and describing briefly the treatment process, was divided into two groupings, one showing installations prior to 1911 and the other for a period after 1911 which was established after research and investigation to be effective as of 1915.

There are certain limitations to the assembled data. As indicated by the inventory title, the information is limited to treatment plants and so excludes the numerous water systems not having treatment facilities. Also the record was presented as not being complete. A State by State review showed that data of only 6 states—Iowa, Maine, Massachusetts, New Hampshire, New Jersey, and Texas—were claimed to be fairly complete. However, the report carries the following explanatory notes: "The filter plants listed comprise at least 85 percent of the filtration plants that are now in operation in the United States, and the population served by these plants is at least 98 percent of the total population served by filtration plants. The list of filter plants having chlorination as an added adjunct and of chlorination plants with no other treatment of the water is rather incomplete."

Presentation of Data

The data for each State were summarized by number of communities and by 1910 U. S. Census populations. The categories include: Total number of communities with treated water; filtration by rapid sand (mechanical), slow sand, and pressure filters; coagulation, including a few miscellaneous installa-

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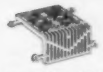
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tions; chlorination only; and a grouping of all installations practicing chlorination.

Table 1 contains a summary of the two inventories. In 1910, there were 557 water treatment works which 5 years later, in 1915, had increased to 830. By 1910 census figures, the population of the communities served in 1910 was about 13,900,000 and in 1915 it was approximately 22,700,000.

Filter plants totalled 519 in 1910 and 680 in 1915. In 1910, there were 427 rapid sand filters, 65 slow sand filters and 33 pressure filters. Comparable statistics for 1915 show 576 rapid sand filters, 69 slow sand filters, and 41 pressure filters. Coagulation and miscellaneous increased from 34 to 42 installations from 1910 to 1915.

Chlorination as the sole treatment process was practiced in only four instances in 1910; this jumped to 108 in 1915. More significantly, from 18 installations using chlorine disinfection and serving about 1,180,000 people in 1910, a rapid increase took place to 340 such installations serving 15,580,000 people in 1915.

Discussion

A review of published records pertaining to the number of communities with treated water shows about 115[1] in 1897; 3015[8] in 1930; 5372[9] in 1940; and 9078[10] in 1948. The 1910 and 1915 data reported 557 and 830 plants respectively. These data are plotted in Figure I to show the rapid increase in treatment plants, that is apparently continuing beyond the present time.

In 1910 there were reported 519 filter plants and in 1915, 680 filter plants, the increase due primarily to rapid sand installations. This last figure may be compared to the 634 filter plants reported by Gillespie[5] in 1924. Since the latter number referred to plants having capacities of 1 mgd and over, many smaller plants were no doubt omitted. On a population basis, 23,664,000 were served in 1924 as compared to about 17,100,000 in 1915 and 13,000,000 in 1910. Referring to Figure 1, it can be estimated that there were about 1800 treatment plants in 1924.

The most striking trend shown by comparison of the 1910 and 1915 data was the rapid increase in the use of chlorination as a disinfecting agent. Even with admittedly incomplete records, chlorination as the sole treatment process increased from 4 to 108 and all plants using chlorination from 18 to 340. The effect of chlorinated water supplies on the typhoid rate is now recorded history.

It has been reported elsewhere[11] that the estimated population served with filtered water totalled about 10,800,000 in 1910 and 17,300,000 in 1914. This compares reasonably closely with the Tarbett data.

An estimate of the total number of water systems in 1915 might be of interest. The Water Works Progress Inventory of Pennsylvania compiled by the State Water Supply Commission from returns collected in 1914 showed 676 municipalities having public water supplies[1] as compared to 97 treatment plants shown for 1915, a ratio of about 7 to 1 for systems versus plants. It is estimated that for the entire country, there would have been about 5,800 water systems in existence in 1915. This may be compared to 3,000 reported in 1895 and 9,000 estimated for 1924.

There appears to be some differences of opinion regarding what constituted water treatment. For example, settling was practiced before the time of these inventories by many communities using river water, such as Kansas City and St. Louis, Missouri. Yet these communities were not included in the statistics. Apparently, the State Health Department did not consider settling a treatment process. Texas, the only State to report settling, showed no coagulation plants. Possibly the term "settling" was applied to coagulation and sedimentation installations in this instance. The original report totalled these installations under a single item: "Coagulation and sedimentation plants".

Several miscellaneous points of interest were brought out by the original inventories. One plant with ozone sterilization was listed. In 1910, one iron removal and two softening plants were in operation. By 1915, 4 softening, 5 iron removal units and 1 carbon dioxide removal plant were recorded.

Summary — Acknowledgment is made of the efforts of the late Sanitary Engineer Director, R. E. Tarbett; these inventories are truly his work. They resulted from his interest in this activity, the need for such data, and the opportunity afforded by the numerous water supply and sewage surveys and extra cantonment health work conducted by field personnel of the U. S. Public Health Service prior to and at the time of the first World War.

Table I—Summary, Municipal Water Treatment Plants

Communities and types of treatment	Number in 1910	Pop. figures based on 1910 Census	Number in 1915	Pop. figures based on 1910 Census
Communities	557	13,912,147	830	22,736,688
Filters—Total	519	12,971,984	680	17,095,893
—Rapid sand	427	7,026,089	576	10,575,151
—Slow sand	65	5,031,328	69	5,154,033
—Pressure	33	914,531	41	1,366,709
Coagulation and misc.	34	648,043	42	737,900
Chlorination only	4	292,156	108	4,902,895
Total using chlorination	18	1,179,636	340	15,576,197

Note: Types of filters not additive as more than one type of filter may be installed at a single plant.

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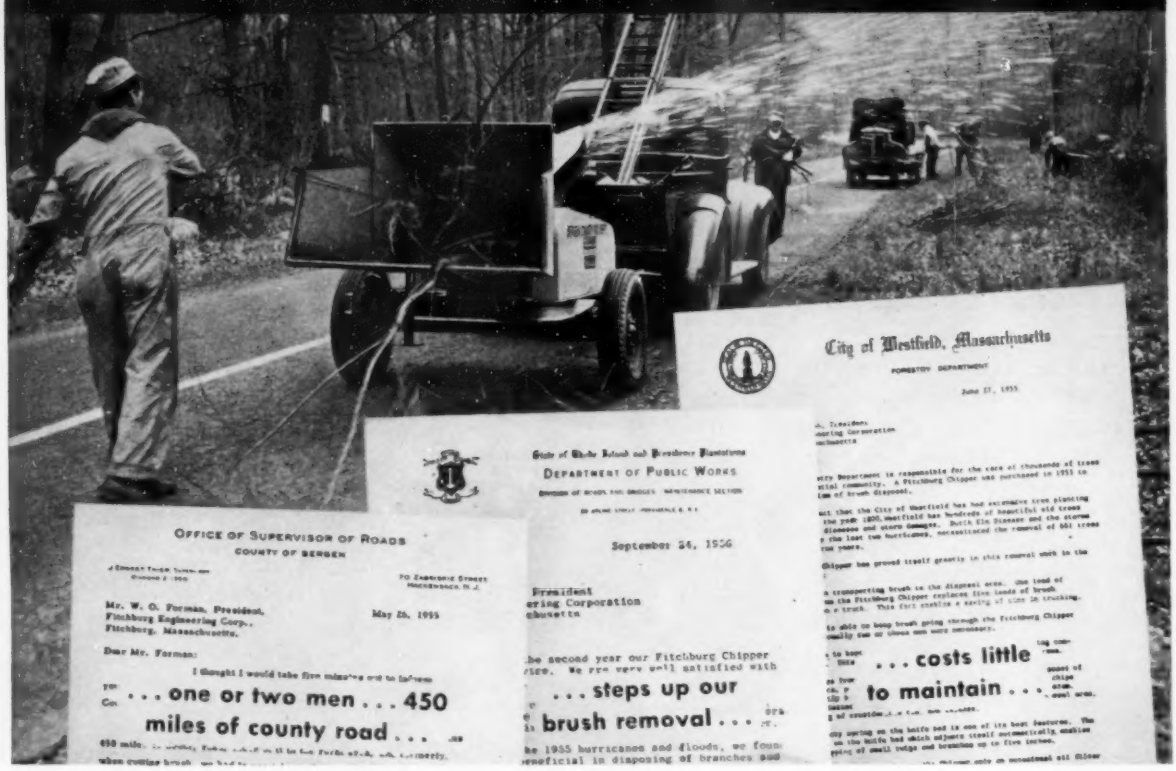
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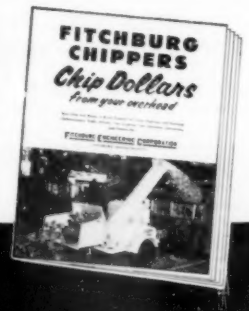

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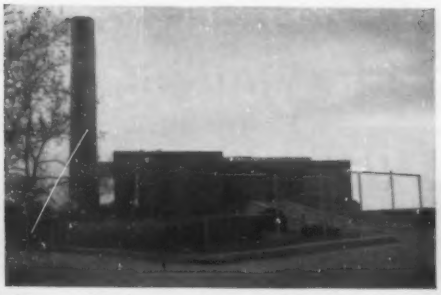

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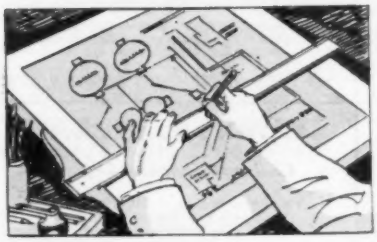

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Urban Intersection Design

(*Continued from page 103*)

An analysis of the factual and physical data and the determination of the type of treatment to be employed at an intersection is not, in itself, conclusive proof that such an approach to the problem is the proper one. It is advisable upon the completion of the analysis to make a further study regarding the location of a proposed facility with relation to the destination of the using traffic and over-all area service before commitment for the purchase of expensive right-of-way. The damage to a business area by the cutting off of buildings or the reduction of essential sidewalk widths to permit necessary street widenings and the possible restrictions to traffic operation should be studied. It is indeed poor planning economy to expend large sums of money on an improvement through a congested area when the traffic desire lines indicate that a location entirely removed from the area will better serve the major flow of traffic with more operational freedom and with less adverse travel distance and, at the same time, will give adequate service to the area itself. The decision regarding the location should take into consideration not only the initial cost of the improvement itself, but should also evaluate the effects upon the community development, fire protection, future city planning and the like.

After evaluations have determined the factual data, what is needed and the location and the type of intersection, the arrangement of the facilities into a safe and free flowing design will depend to a large extent upon the initiative of the design engineer. Normally, however, the development of the geometric layout will follow lines dictated by the various elements of design which are to be incorporated therein, such as deceleration or speed change lanes, weaving sections and merging facilities and the accompanying control elements of design features such as terminal designs, approach nose treatments, island designs, etc. The actual outlines now resolve into the most advantageous arrangement of the geometric features.

Economics and Road-User Benefits Ratio

The administrative engineer must give joint consideration to income and expenditure, and to the cost of improvements together with the benefits to be derived. Hence, to a

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degree, he controls the extent and cost of an improvement. Economics in a highway sense are concerned with the cost of a proposed improvement and the general value resulting therefrom. The cost includes right-of-way, construction, maintenance, and operation, and the general value includes services and benefits to the community and road users. The relation of cost to benefits is a joint consideration and is a measure of justification for location and in determining the geometric features of design.

Quite often there are several logical and feasible locations for a facility or workable arrangements of design features. An analysis of the various plans and designs is desirable to determine the most practical and logical one. In the case of location problems, preliminary plans and profiles for the various logical alternates are prepared. In intersection problems, several alternate schemes of treatment are made and studied for suitability in meeting traffic needs and practicability for the site and design controls. In both instances, cost studies are made for each alternate preliminary plan or intersection study, including such considerations as land acquisition, clearing the site, construction, maintenance, utility changes, maintenance of traffic during construction, etc. Road-user costs and the index of road-user benefits for the alternate plans or studies are calculated.

An analysis of the alternate locations or intersection design treatments, which would include not only a comparison of road-user costs and road-user benefits but also such considerations as directness of vehicular paths, operational characteristics, stage development, damage to the established pattern of community life, and accident potential, will give a sound basis from which a practical and realistic determination may be made. One cannot assign a weighted value to any one of these items, but the summation of comparative ratings of the desirability for one plan as compared to that of another for the various items compared will certainly serve as a valuable guide.

Conclusions

A rational approach to the development of adequate and sufficient urban intersection design may be summarized briefly:

1. Obtain all physical data for the site and determine those affecting or influencing the facility. 2. Collect and analyze the traffic data to de-

termine the traffic flow pattern and the necessary geometric control dimensions and facilities. 3. Collect and analyze all factual data, including accident reports, future city planning in that area, services to the area, etc. 4. Determine the location. 5. Determine the type of facility. 6. Prepare alternate developments for study of suitability in meeting traffic needs and practicability of the site and design controls. 7. Calculate cost estimates for each alternate plan. 8. Calculate road user costs and index of road user benefits for each alternate plan. 9. Joint analysis of plans from step 6 through 8 inclusive to reach conclusions as to the preferred plan. 10. Preparation of detailed design.

• • •

2-Way Radio Boosts Service

(*Continued from page* 111)

.he field: The system lists C-1 (car one,) C-2, and then T-1, through T-6, for trucks. A vertical column on the right of the board lists 10-7 and 10-8. An employee leaving a car or truck calls in, "C-1, 10-7," and, when he returns to his vehicle calls in, "C-1, 10-8." The dispatcher at the garage then is able to log, from work orders, the exact location of the mobile unit, and the time. Management has a very good picture of every move being made in the field, and can streamline its functions to the *n*th degree.

Supervisory personnel, such as Mr. Link and David R. Jones, distribution superintendent, with mobile radio units in their cars, are able to function more effectively. Calls from the office remote control unit can alert them to emergencies, make or break appointments, convey important messages to be relayed to homes, police or fire departments.

In all, Shenango Valley Water Co. uses mobile two-way radio communication in two trucks for distribution foremen, the plant superintendent's truck and four service trucks; including the two automobiles, nine vehicles are equipped. The main transmitter is located in a booster pump building near a water tower on Farrell's outskirts, where the antenna makes use of the water tower's height.

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The new Contoura-Matic photocopier just announced by F. G. Ludwig, is a precision engineered unit that is only 15 ins. wide and 6 ins. deep. It takes up half the desk space of a standard typewriter. A plastic cartridge of premixed processing liquid developed to eliminate mixing and pouring is featured. It merely snaps into place to pour in and out of the machine automatically. To dispose of the plastic container full of exhausted developer, the packet is sealed and dropped in the wastebasket. For more details write Luden Associates, Inc., 4 Colonial Green Building, Westport, Conn., or circle **No. 2-1** on the reply card.

Waterproofing Agent Keeps Underground Interiors Dry

A waterproofing agent, manufactured by Dakota Engineering, Inc., is now available to stop all pressure seepage and flow of water through brickwork, concrete and stonework. It is stated that the material is not a water repellent or retardant, but that it is impervious to the passage of water or moisture, including water under hydrostatic pressure. Aplied on masonry walls and structures, it stops capillary action, thus preventing above-ground dampness and consequent flaking off of paint. Efflorescence, water streaks, discoloration and fungus growth are eliminated. In application, the material is mixed with cement, sand and water, and trowelled onto masonry walls. It can be applied on the water pressure side of the wall, or on the side opposite pressure. Designated as "Aqua-Tyte," the material bonds compatibly to masonry, and trowels off to a smooth finish having the inherent color of Portland cement. For more details write Dakota Engineering, Inc., Chemical Div., 6641 Crenshaw Blvd, Los Angeles 43, Calif., or circle **No. 2-2** on the reply card.

Asphalt Liner for Containment of Water and Wastes

A new product called Aqualiner, available from Presstite-Keystone, is a prefabricated asphalt liner designed for heavy duty service in the positive containment of water, brines, sludges, wastes or sewerage. Typical installations include reservoirs, municipal water supply systems, irrigation canals and military installations. It is a heavy duty asphalt mastic sheet which, for added toughness and ease of handling, is surfaced with asphalt-saturated felt liners. The liner is coated with a high-melt-point, weather-resistant asphalt film to give added resistance to exposure conditions encountered in reservoir, canal, and related installations. It is available in two thicknesses, ½-in. and ¼-in., in 4-ft. widths. Aqualiner is sufficiently flexible and plastic to respond to repeated contraction and expansion, ground movement or frost action without breaking or rupturing. Neither rodent damage nor weed control are problems. For more details write The Presstite-Keystone Engineering Products Co., 39th & Chouteau Ave., St. Louis 10, Mo., or circle **No. 2-3** on the reply card.

Asphalt liners are used in reservoirs and in municipal water supply systems

Tow-Type Vibratory Roller

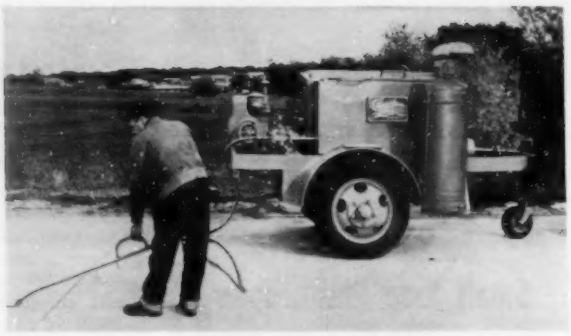
A new tow-type vibratory roller for grade, base and surface consolidation is announced by Bros Inc. Named the Bros Vibra-Pactor, this machine features a static (gross) weight of 4½ tons and a controlled

variable vibratory force equal to a range from 7½ tons to 10½ tons. Vibratory frequency range is 1100 to 1300 vibrations per minute. Of special importance in the Vibra-Pactor's design is its quarter inch amplitude, the distance the drum is raised from the ground in each revolution. The thumping or impact force combined with the drum weight helps achieve densities in excess of standard AASHO requirements in heavy cohesive subgrade and embankment materials. Drum diameter is 48 ins., rolling width is 66 ins. The machine is powered by a 40-hp gasoline engine. For complete information write Bros Incorporated, Road Machinery Division, 1057 Tenth Ave., S. E., Minneapolis 14, Minn., or circle **No. 2-4** on the reply card.

Trencher For Small Water Systems

The Model M Ditch Witch trencher can be used for small water lines and lawn sprinkler installations. It is offered with the following features as standard equipment: 9.2-hp Wisconsin air cooled engine; larger drive wheels for better traction; quick adjusting clutch link to adjust for drive belt; and two types of digging teeth cup cutters and chisels. The unit is offered standard for 4-ft. maximum depth and 6-in. maximum width trench. For more details write The Charles Machine Works, Inc., 683 Birch Street, Perry, Okla., or circle **No. 2-5** on the card.

Case tractor-loader has many new features in safety design



Clipper joint sealers are used on highways and airfields

Rear-Wheel-Steer Tractor-Loader

A new 4-wheel drive, rear-wheel-steer tractor-loader, which is said to incorporate revolutionary advancements in operating and safety features in the 1¾-cu. yd. class, is announced by J. I. Case. The unit, designated as the W-9 Terraload'r, is the forerunner of a complete new series of heavy duty rubber tired industrial loaders to be introduced by Case. Three interchangeable buckets are available for the W-9, 1⅜-yd. (heaped) digging bucket; 1¾-yd. material bucket; and 2¾-yd. light material bucket. Location of the lift-arm-pivot, and elimination of all linkage in the back of the bucket are also said to offer important safety advantages, since the operator has unobstructed visibility in all directions, and can easily get on or off the machine, regardless of whether the boom is up or down. A 42.5-gpm hydraulic pump, operating at 1800 rpm, gives the W-9 a breakout force of 11,000 lbs. at ground level, and a lifting capacity of 5500 lbs. with bucket in carry position. The hydraulically operated transmission has three speed ranges to 21 mph, (both forward and reverse) with full power-shift in all speeds, forward and reverse. There are also an infinite number of in between speeds, automatically balanced to changing loads. A simple shuttle lever makes it possible to change from high to low-speed range, or from forward to reverse, without mechanical shifting. For further information write J. I. Case Co., Racine, Wisc., or circle **No. 2-7.**

Hot Point Joint Sealer

The Clipper Mfg. Co. announces that several changes have been made in their Hot Pour joint sealer. Model AC-40A combines in one compact unit the equipment needed for melting and properly applying the sealing compound. Featuring one-pass pressure sealing, direct from kettle to joint, the unit is equipped with a new type material pump, the "Moyno." The pump produces a smooth flow without pulsation. A simplification of the piping and distribution systems has eliminated the need for extra valves and minimized the possibility of material "freezing" in the pipes. An improved 18-hp, 4-cycle, 2-cylinder air-cooled Wisconsin engine is used. The engine is propane fired, and is equipped with a clutch and reduction gear. For complete information write to the Clipper Mfg. Co., Suite 226, 2800 Warwick, Kansas City, Mo., or circle **No. 2-9** on the reply card.

Sprinkling System

Hiller Engineering Corp. has developed a new sprinkling system designed especially for resorts, golf courses, parks, homeowners and any other application where the area to be watered is too large for conventional single sprinklers. The Wheel-Trac systems, as they are called, come in 20, 40 or 60-ft. lengths and consist of 2, 4 or 6 10-ft. sections of aluminum pipe together with rubber wheeled swivel dollies and end dollies which hold the sprinkler heads. The rubber wheeled dollies make the system completely portable, and the swivel dollies, used at the inside connections, track perfectly. These allow a 45° angle at each connection, permitting watering odd shaped areas. The systems operate on water pressure as low as 5 pounds, and a single 60-ft. system can cover an area up to 2,700 square feet. Further information from Hiller Engineering Corp., 64 McClellan Street, San Jose, Calif., or circle **No. 2-6** on the reply card.

Vibrating Roller

A new tractor drawn vibrating roller using a hydraulic fluid motor instead of a gasoline engine has been announced by Rolcor Industries. It is 5 feet wide and 2½ feet in diameter; the Hydrapac weighs 3260 lbs. loaded and can be attached to the rear end power takeoff of any tractor. High compaction densities are easily obtained and use of hydraulic power has greatly simplified the mechanism. For more details write Rolcor Industries, 1108 Nicollet Ave., Minneapolis 3, Minn., or circle **No. 2-8** on the reply card.

Unit can be attached to the rear end power takeoff of any make of tractor

New Loader and Traction Duo Offered By Freeman

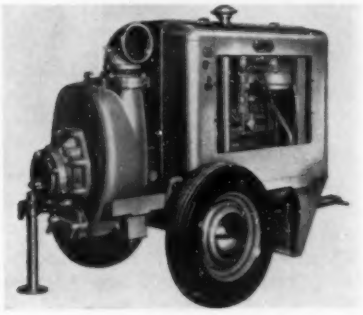
An industrial front-end loader for Ford and Ferguson tractors, and traction-flotation wheels for most all makes of tractors, are offered by Freeman Loader Corp. The loader features a frame of high carbon solid steel and lifts a load of 1750 lbs. to a height of 10 feet (to bottom of bucket). All cylinders are double-acting, with chrome-plated rams and hardened pins having zerk fittings. The flotation wheels, called Xtra Trax, give positive crawler-action to wheel-type tractors, and reduce slippage under any soil conditions. They eliminate necessity for wheel weights or fluid in tires, and are of steel construction. Attachment is easy and they need not be taken off for operation on cement or surfaced roads. For further details write Freeman Loader Corp., Peru, Ind., or circle **No. 2-10** on the reply card.

G-E UHF Base Station Radio Transmitter

General Electric has a new high power UHF base station radio transmitter designed to give dispatchers of mobile communication systems more ability to reach vehicles traveling in outlying areas. Engineered to deliver up to 250 watts, the unit may be licensed for operation in the 450-460 mc band. For example, an operator of a G-E 15-watt station transmitter who is now covering 20 miles with his unit may talk up to 30 miles with the super-powered set. All components and test points are readily accessible from the front or the rear of the unit. No hazardous voltages are exposed when the front door is open. The rear door has a safety feature which automatically grounds high voltages as the door is opened. Power output is measured by a built-in test meter. For additional information write General Electric, Communication Products Dept., Syracuse, N. Y., or circle **No. 2-11** on the reply card.

Dual-Duty Pressure and Dewatering Pump

Specially designed for pumping large volumes of water at high heads, this Jaeger Model 6PH can pump 1050 gpm at 60 lbs. for pressure service, or handle 100,000 gph at 10-ft. suction lift as a dewatering pump. It offers a double advantage on wellpoint work: High pressure to jet in wellpoints, and



Dewatering pumps are used on construction jobs and by water departments

then big volume to dewater them. The unit self-primes rapidly and holds prime indefinitely. Shaft is in a high capacity ball bearing and has the Jaeger Lubri-Seal which is not only positively lubricated for long life but is accessible for inspection without dismantling the pump. For more details write, The Jaeger Machine Company, Columbus 16, Ohio, or circle **No. 2-12** on the reply card.

Distributors are available in 3 sizes

Distributor For Applying Bituminous Materials

Municipal Supply Company have a new bituminous distributor, the "Thriftline." The distributor has been designed to do an economical job of heating and applying all types of bituminous material. The clean-cut appearance of the unit is made possible by the rear housing which covers the pump, engine and all piping. This fog-proof, heated housing serves as a high operator platform, giving the operator 360° visibility. The piping system, equipped with leakless valves, is only 5 feet in length. The burner boxes are completely enclosed. Standard equipment includes a 36-hp, air-cooled engine; 375-gpm pump; 12-ft. suck-back spray bar with positive cut-off; hand patching hose and spray arm; 5th wheel tachometer and pump tachometer; and hydraulic spray bar lift. The distributor is manufactured in 1000, 1250, and 1500-gallon sizes. All are for truck mounting. For additional information write Municipal Supply Company, Dept. T-19, 2508 S. Main Street, South Bend, Indiana, or circle **No. 2-13** on the reply card.

Heavy Duty 280 GPH Steam Cleaner

A new heavy-duty steam cleaner, designated the 280 "Blast-Master," has been announced by the Clayton Mfg. Co. Completely self-contained and fully automatic, this new model is equally effective for light, medium, heavy or extra heavy cleaning. The exclusive "Fleximatic Control" feature which automatically regulates fuel to the burner and water flow to the coil, permits the operator to select and use all or any part of the 280 gph capacity from one or even two guns. Vapor expansion is controlled for a concentrated, high velocity delivery through a vacuum nozzle, providing a high impact for heavy duty industrial cleaning. Accurately controlled vapor delivery permits effective heavy duty cleaning at distances of three feet or more, with all of the volume and pressure that can be effectively employed through a single cleaning gun. For further information write Clayton Mfg. Co., 401 No. Temple City Blvd., El Monte, Calif., or circle **No. 2-14** on the reply card.

Electronic Flasher For Construction Work

In order to increase ruggedness for construction use and make the item theftproof, R. E. Dietz Co. has added improvements to its electronic highway warning flasher, the Visi-Flash. The flasher is now available with a theftproof locking device for attaching the flasher to barricades and other supports. Because the Visi-Flash uses transistors for electronic switch purposes, it is more compact and more able to withstand jolts. It is available in four models, a barricade type with either two-faced head or 360 degree head, and a model which fits into a traffic cone and has either the two-faced head or 360 degree head. Flashing rate, which can be regulated, is 60 to 70 times per minute. Further information from Hazard Warning Lighting Division, R. E. Dietz Co., 225 Wilkinson Street, Syracuse 1, N. Y., or circle **No. 2-15** on the reply card.

Hydraulic Unit For Waste And Trash Hauling

A new truck-mounted, hydraulically operated unit for lifting, loading, transporting, and dumping multiple unit steel trash and dry-garbage containers is announced by the Cobey Corp. The Perfection "Liftainer" incorporates many new mechanical improvements and features with speed up operation, increase payload capacities, and cut maintenance costs. All hydraulic lines are high-pressure, reinforced, flexible hose, eliminating swing joints. All standard types of containers are available including apartment, universal drop-bottom, tilt and skip. For further details write Cobey Corp., Galion, Ohio, or circle **No. 2-16** on the reply card.

Device for handling trash containers

Galion has recently added an extra heavy duty model to their line of graders

Model 160 Galion Grader

Galion has just added to their grader line the extra heavy-duty Model 160. It has a 6-cylinder, 4-cycle, 160-hp Cummins diesel engine and the total weight of grader is 30,020 lbs. with scarifier. The grader has a constant-mesh transmission, with six overlapping forward speeds varying from 1.3 to 22.6 mph, and high and low reverse speeds. The clutch is not affected by heat or cold, and gives full-load power delivery, under any condition, at all times. Listed as standard equipment are a 13′ x 29″ x ¾″ hydraulic shiftable moldboard, combination hand and hydraulic booster steering and four-wheel brakes. For complete information write the Galion Iron Works & Mfg. Co., Galion, Ohio, or circle **No. 2-17** on the reply card.

Model PM-430 Patchmobile

The Model PM-430 Patchmobile is a completely new portable, hot-asphalt plant. The machine is more compact, with greater capacity, lower aggregate charging height, and higher mixed material discharge height. The basic large plant principle of a rotary dryer for drying aggregate and a separate pugmill for mixing aggregate and asphalt, as well as hot asphalt storage are combined in this single trailer unit. When operating as a mobile unit, the plant is towed by the dump truck hauling the sand and gravel for the mix. Material is shoveled from the truck into the charging hopper. The material is then fed from the charging hopper by the reciprocating feeder into the dryer, and passes through the dryer into the batching hopper. When the machine operator discharges the material in the batching hopper into the pugmill, a pre-set amount of asphalt is automatically sprayed into the mix. The mixed material from the pugmill can be discharged into the shoveling pan, onto the pavement, or into a wheelbarrow, as desired. For more data write Wylie Mfg. Co., 640 N. Meridian (Box 7086), Oklahoma City, Okla., or circle **No. 2-18** on the reply card.

Portable plant is designed for small paving projects and paving maintenance

Crawler Loader For Construction Work

The Oliver OC-15, a 110 net engine hp crawler, has available a new 2½-yard loader of fully hydraulic operation. It is a low-profile loader, with side pedestals kept well below the usual level. This design arrangement results in maximum working stability and full operator visibility throughout the loading cycle. For more information write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, O., or circle **No. 2-19** on the reply card.

Powerful Rotomist Sprayer

An all-new shade tree sprayer that moves 60,000 cfm at a velocity of 95 mph is now available from John Bean Div. The aerodynamically designed unit is used primarily for shade tree spraying although it has been proven effective for fly and mosquito control and fall leaf collection. This is accomplished by blowing the leaves into windrows which are easily picked up. The trailer-mounted unit rotates 360° on its turn table and the air tunnel elevates through a 110° arc from the vertical. It is powered by a 120 hp engine and has a tank capacity of 300 gallons, from which the material can be pumped to the three nozzles in the air stream at pressures up to 400 lbs. by a high pressure pump. The trailer model stands 9 feet from the ground and is 8 feet wide and 11½ feet long. For complete information write John Bean Division, Food Machinery and Chemical Corp., Lansing 4, Mich., or circle **No. 2-20** on the reply card.

Package Waste Treatment Unit

Dorr-Oliver Incorporated announces the availability of the Dorr-Oliver CompleTreator, a self-contained unit providing complete waste treatment facilities for small plants. Utilizing a standard two-stage Biofiltration flowsheet, this newly developed package plant will handle wastes of 150 persons or their equivalent in solids and BOD. It is particularly applicable to treatment of wastes from small housing developments, restaurants, service stations, military installations and schools. It is a completely assembled unit contained in an 11-ft. 6-in. diameter by 19-ft. 9-in. high steel

tank. It comprises a Dorr Duo-Clarigester annularly surrounded by two stages of high-rate trickling filters and equipped with two recirculation pumps and required electrical equipment. The flowsheet utilized is identical to that of a standard two-stage Biofiltration installation comprising two clarifiers, two filters and a separate sludge digester. It is also the same as the two unit Duo - Clarigester - Duo - Filter combination successfully employed to treat wastes from turnpike service areas. Further information may be obtained from Dorr-Oliver Incorporated, Barry Place, Stamford, Conn., or circle **No. 2-21** on the reply card.

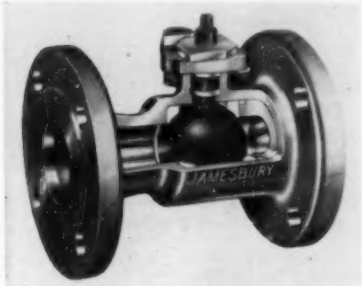
Spreader Box For Highway Construction

Unit is moved easily from job to job

A new special-purpose, base spreader box has been added to the Cmetco Rola Paver line by Creative Metals Corporation. This spreader box is equipped with front lift wheels which are instantly adjustable while the paver is in forward motion. While primarily designed for spreading cement treated or crusher run base, it is equally suited to asphaltic mixes. The lift wheels are raised or lowered independently of each other to lay passes from ½-in. up to 8 ins. deep or even deeper, either in uniform or tapered pass thickness. This spreader is said to be able to lay base materials at the rate of twenty 10-yard trucks per hour. While paving it is truck-towed by means of a chain and harness reaching to the front bumper of the truck. The unit is job to job moved by simple chain attachments to the rear of the dump body which lifts it off the ground. Further information from Creative Metals Corp., 1290 Powell Street, Emeryville, Calif., or circle **No. 2-22** on the reply card.

A New Line Of Small Size Flanged Valves

A new line of small size flanged "Double-Seal" ball valves, in ½ to 2-in. sizes, has been announced by Jamesbury Corp. Features included are unique "unit-body construction," positive shut-off, low torque over complete pressure range from vacuum to full rated pressure, high flow capacity with minimum friction loss, and seats and seals which are interchangeable and replaceable. For complete information write Jamesbury Corp., Worcester, Mass., or circle **No. 2-23** on the reply card.



Flanged valves have positive shut-off

Distance Measuring Simplified By New Rolatape Instrument

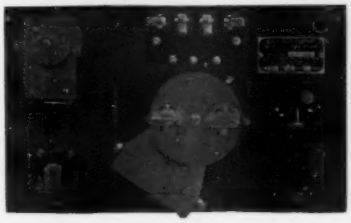
Accurate measurements can now be taken conveniently from a moving vehicle with the Rolatape Model #400 extended handle measuring wheel. The 30-inch long handle enables the driver to guide the measuring wheel with ease while operating the car at a moderate speed. This feature is especially useful for

taking long distance measurements where measuring on foot is impractical or inconvenient. Scientifically calibrated wheel and special counting mechanism assure accurate measurements, which are recorded in feet up to a distance of nearly 19 miles. For further information write Rolatape, Inc., 1741 Fourteenth Street, Santa Monica, Calif., or circle **No. 2-24** on the reply card.

Traffic Controllers

The Type "F" traffic controller, made by Econolite, is universally applicable in the field of pre-timed traffic control. Initially applied to present day needs, this type of controller can be adapted to more complex future problems by the simple addition of dials, units, relays and other accessories. Also made by the same company are both vehicular and pedestrian signals. For full details write Econolite Corp., 8900 Bellanca Ave., Los Angeles 45, Calif., or circle **No. 2-25** on the reply card.

RPS ROTO-TROL



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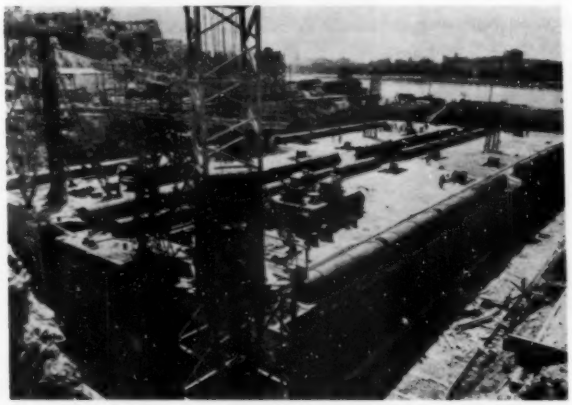
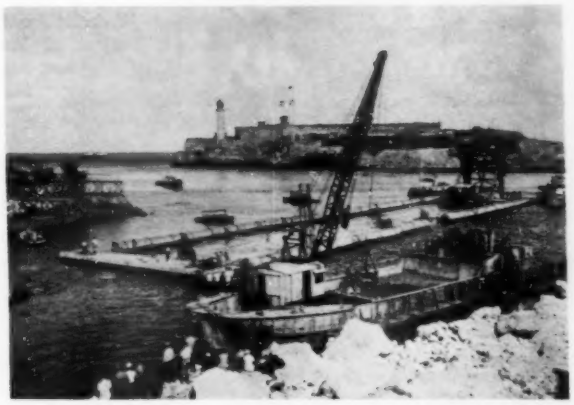
—Worth Seeing

Waterproofing a section of the 4-lane underwater tunnel connecting the City of Havana, Cuba, with Guanabacoa, required over 800 drums of Standard Dry Wall Products "Waterplug" to seal joints where water was entering, as at the right. The entire tunnel was waterproofed inside and out with "Thoro" system products, using thousands of drums of "Thorite" and "Thoroseal" in addition to the "Waterplug."



Precast, post-stressed section of the tunnel nears completion. The pontoons will help float the section into place. Finished tunnel is 733 meters long, 23 meters wide and 7 meters high.



Gull's-eye view shows a section being towed to position. Famous Morro Castle is in background. When in place, deepest section will be 80 feet underneath the surface.

First of the type "F" traffic controllers made by Econolite Corporation was completed November 21, 1957, less than two months after Econolite purchased the traffic signal and control business from General Electric and moved necessary production machinery from GE's North Carolina plant to Los Angeles. In photo above, Econolite's President Arthur Lewis and Vice-President Leo Jennings admire the first unit off the assembly line. (By the time you see this, Sales Manager Aubrey "Red" Matthews will have sold it!)

Before taking over as Executive Secretary of the American Public Health Assn., one of Dr. Berwyn F. Mattison's last official acts as Sec'y of Health and Chairman of the Pennsylvania Sanitary Water Board was this signing of the industrial wastes permit for the Shippingport (Pa.) Reactor.

Meet AWWA Specifications C 504-55T . . .

LEOPOLD
Rubber Seated
BUTTERFLY VALVES

with exclusive valve seat design that assures added firmness, increased rigidity, and permanent concentricity of seat to valve body!

In the Leopold construction, there's no possibility of abnormal wearing of the valve seat—a common cause of valve failure. That's because the seat is of pure gum rubber or resilient neoprene vulcanized around a *continuous steel ring insert.* Thus, Leopold Valves last longer and always provide positive drop-tight shut-off. Available in sizes 6″ to 96″ with manual or automatic controls.

Write for details!

Leopold

F. B. LEOPOLD CO., INC.
Zelienople, Pa.
Complete Water Purification and Filter Plant Equipment

by Arthur K. Akers

★ HAROLD E. BONCUTTER is new advertising manager, Hercules Galion Products, Galion, O.

★ HAROLD A. JONES moves up to vice-president and Midwestern Area sales manager for Motorola.

★ A. E. WILLIAMS succeeds R. A. Ferreira, voluntarily retiring, as general sales manager, Robinson Clay Product Co., Akron, Ohio.

★ W. H. HIPSHER, executive vice-president of Mueller Co., Decatur, Ill., has been elected to the Board of

Mr. Hipsher

Mr. Gannon

Directors, National Association of Manufacturers. Also at Mueller, Dan R. Gannon is appointed general sales manager.

★ STANDARD STEEL CORPORATION'S (Los Angeles) southeastern sales of asphalt plants will now be under direction of W. Spence Flinn, 4502 S. Choctaw Road, Chattanooga, Tenn.

★ BADGER METER CO. appoints Henry DePagter western district sales manager, to be located at their new sales and service center in San Pedro area, Los Angeles.

★ GEIGY AGRICULTURAL CHEMICALS Division, Ardsley, N. Y., appoints Leo Miles as Simazin industrial sales specialist for their new pre-emergence herbicide.

★ STEPHEN W. BENEDICT is elected president, The Master Builders Co. Division, American-Marietta Co.

★ CHARLES J. SCHLEEWEIS becomes general sales manager, Wintroath Pumps Division, Worthington Corporation, in Los Angeles.

★ HERSEY MANUFACTURING CO., Dedham, Mass. (water meters) elects Walter A. Hersey, president since 1924, to the position of chairman of the board. The new presi-

Mr. W. A. Hersey

Mr. W. P. Hersey

dent and chief executive officer will be Winthrop P. Hersey. Francis P. Hersey continues as vice-president, treasurer and secretary.

★ DORR-OLIVER Inc. opens a new midwest sanitary sales office at 4117 Broadway, Kansas City, Mo., with Joseph V. Swift, formerly of Atlanta office, in charge.

★ THE CARBORUNDUM CO. reorganizations bring J. M. Smith to the position of manager of Marketing Department, at Perth Amboy, N. J.

★ MORTON SALT CO., Chicago, news includes elevation of R. A. Simpson to general industrial sales

Mr. Simpson

Mr. Dewey

manager, while Allan C. Dewey is now manager of the Commercial and Rock Salt Department.

★ ROBERT K. HAMPTON becomes Hampton Engineered Equipment Co., 50 Church St., New York. He will continue to represent Beaumont Birch Co. and others.

★ WHEN times get tough the American people will give up the necessities of life—but just try to take the luxuries away from them.

3 reasons why you can depend on getting

unmatched concrete performance and economy with *time-tested* POZZOLITH®

General Motors Technical Center — 25-building research facility near Detroit. Archt. — Eero Saarinen & Associates, Bloomfield Hills, Mich. Archt. Engr. — Smith, Hinchman & Grylls, Inc., Detroit. Contr. — Bryant & Detwiler Co., Detroit. POZZOLITH employed in concrete.

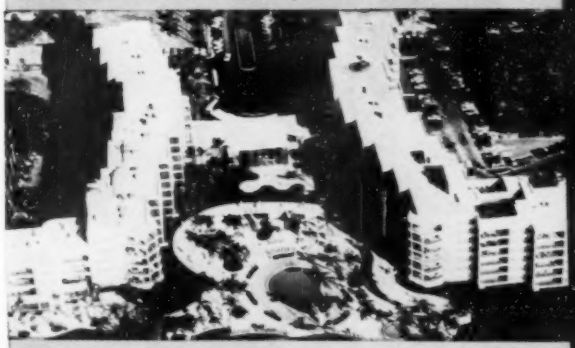
Third tube of Lincoln Tunnel, under the Hudson River. Owner and Engineer: The Port of New York Authority. General Contractor: Joint Venture — Mason, Johnson and MacLean, New York City. POZZOLITH Ready-Mix concrete produced by Hudson Builders Material, Inc., Jersey City, N. J.

constantly improved since 1932 to provide top-quality concrete and lowest cost-in-place concrete

TIME-TESTED . . . Developed in 1932, POZZOLITH has since proven its performance in the nation's leading structures. Architects and engineers repeatedly employ POZZOLITH because it assures unequaled efficiency and uniform dependability. In the past 5 years alone, POZZOLITH has been used in more than 67,000,000 cubic yards of concrete.

APPLIED RESEARCH . . . Master Builders' research resources — unequaled in our industry — insure the latest in product improvements, new products and product quality control.

FIELD SERVICE . . . 100 full-time Master Builders' field men provide valuable product-use know-how. They work closely with architects, engineers, contractors, concrete producers, owners and commercial testing laboratories — making promptly available our 48 years of experience in concrete.



Palm Beach Towers Hotel, Palm Beach, Fla.; Arch. — John Hans Graham & Assocs., Washington, D. C.; Struc. Engr. — Oboler & Clarke, Miami; Consltg. Engr. — Norman C. Schmid & Assocs., Palm Beach; G. C. — Taylor Construction Co., Miami; POZZOLITH Ready-Mixed concrete — Burnup & Sims, and Rinker Materials, West Palm Beach.

these assure you . . . TOP PERFORMANCE AND ECONOMY

. . . POZZOLITH is specified with confidence because it provides concrete of highest quality and lowest cost in place, and has been doing so for 25 years.

NEW BOOKLET "Concrete Control Facts" tells how POZZOLITH improves control of concrete properties. Write for your copy.

Placing the first concrete pavement in the 41,000-mile interstate Highway System to be constructed under the Federal-Aid Highway Act of 1956: A 4-mile stretch of 24-foot concrete pavement on U. S. Route 40 west of Topeka, Kansas. Kansas State Highway Commission. Contractor: Koss Construction Co., Kansas Division. POZZOLITH employed in concrete.

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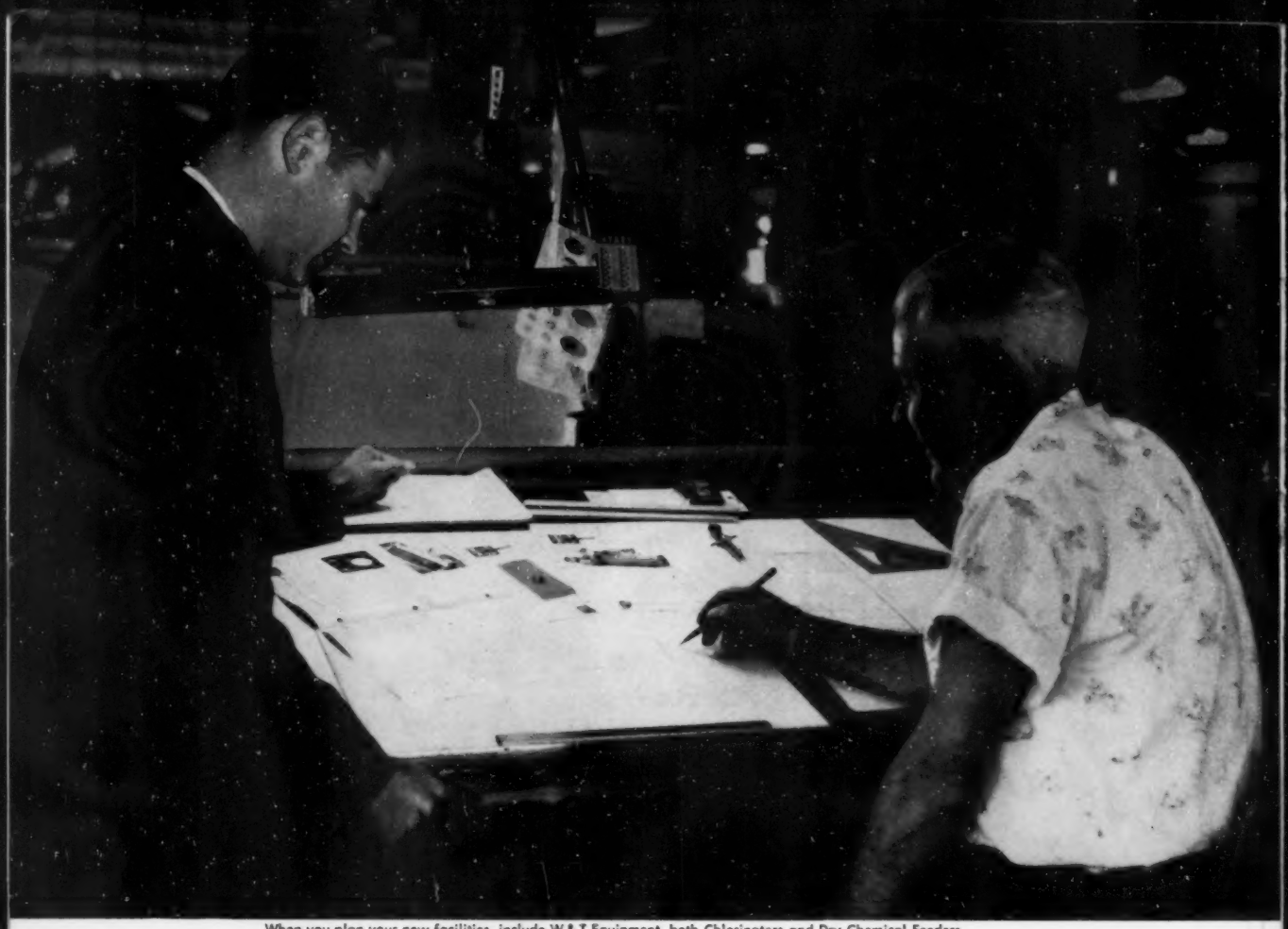

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W&T makes both volumetric (volume measurement) and gravimetric (weight measurement) feeders. There is a feeder for any size job, from small equipment to measure out ounces, to accurate giants capable of handling thousands of pounds per minute.

To find out more about W&T Dry Chemical Feeders, write for bulletin S-120. Or let us know the type of feeder problem you have, so we may send publications describing the W&T equipment best suited for your job.

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